DECEMBER 10 1960

Chemical Week

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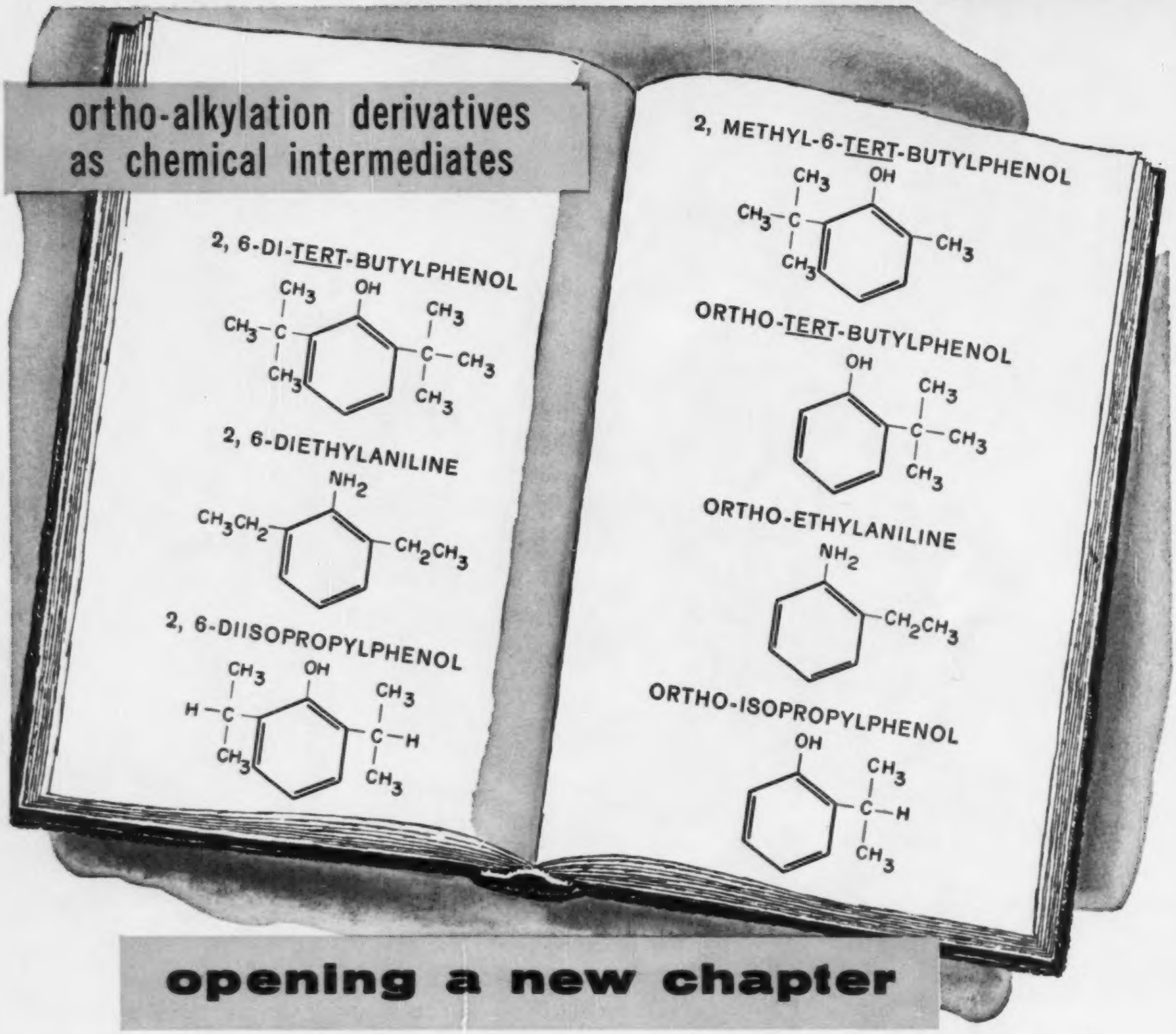

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ON THE COVER: The Los Angeles Municipal Building looms through the smog that typifies the hazy and muddled controversy over air pollution in many areas of the U.S. (see p. 37).

Chemical Week

Vol. 87, No. 24 DECEMBER 10, 1960

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Should We Heed Scientists?

"THE WAR MIGHT HAVE ENDED A BIT EARLIER and with less cost."

This intriguing but irretrievable prospect was held out to a Harvard University audience last week by C. P. Snow, the distinguished British novelist and scientist. His point was that World War II might have been shortened had not the decision been made—against the advice of some of Britain's top scientists—to employ strategic bombing against Germany in 1942-43.

Snow told of the conflict between Sir Henry Tizard, who had pushed the development of radar before the war, and Lord Cherwell, who was Winston Churchill's scientific advisor.

Tizard and P.M.S. Blackett, another physicist, found on scientific grounds that Lord Cherwell's estimates of strategic bombing effectiveness were five or six times too high. This indicated that a different strategy, both for production and for use of troops, was required.

But Lord Cherwell's policy, backed by the Air Ministry, was put into effect. Tizard was labeled a defeatist and his opinions were effectively quieted.

But after the war's end, the strategic bombing survey found that Cherwell's estimates had been 10 times too high, and Tizard was able to say: "No one thinks now that it would have been possible to defeat Germany by bombing alone. The actual effort in manpower and resources that was expended on bombing Germany was greater than the value in manpower of the damage caused."

This story points up the value of scientific advice in the establishment of national policy—and the expensive consequences of not following it. We are happy, therefore, that our own government—and the Dept. of Defense in particular—has a corps of top scientists to which it can turn.

But here, too, there is a real danger. For the past couple of years especially—since the Soviets launched the first Sputnik—science and scientists have been lionized. School curricula have been refurbished to emphasize science, and scientists have left the familiar precincts of their classrooms and laboratories for the different and exciting world of the TV studio and the after-dinner circuit. It would be strange indeed if they failed to recognize their own new importance—a recognition that may lead them to confuse their own voices with the Voice of Destiny. They may forget that they're human—and hence subject to human fallibility.

Scientists, like other people, are believers or agnostics, conservatives or liberals, Republicans or Democrats. And these issues—like many others that involve the spirit and temper of Man rather than his reason alone—cannot be disposed of by the application of scientific laws and the clicking of computers. But there is a great temptation for men and women who have achieved prominence—whether in science, business, the clergy, flying the Atlantic, or singing in movies—to speak out on issues beyond the area of their special competence. They have every right to do so—as citizens; but let them, and us, remember that such opinions are no more valid than the next man's except insofar as they are enlightened by special training and experience.

They Miss Viewpoints

To the Editor: Your Nov. 12 issue did not contain your usual editorial. It is my belief your editorials have become an integral part of Chemical Week.

It is hoped the Nov. 12 issue did not contain an editorial because of the national election and that the Nov. 19 issue contains the Chemical Week editorial as usual.

R. R. Wesley, Jr.
The Carborundum Co.
Akron, N.Y

To the Editor: Where's the editorial in the Nov. 12 issue?

That's what I read first. Hardly knew where to start without it.

Hope this is only a temporary absence from your magazine.

R. L. Luckhardt
Collier Carbon and Chemical Corp.
Los Angeles

Yes, following the election results was certainly one factor. We felt that it was better to skip the Viewpoint rather than write one hurriedly without proper research.—Ed.

Copying Paper

To the Editor: In your Nov. 12 article "Chemicals Find New Office Copying Jobs" you describe an Interchemical product without identifying us with it. . . . It is IC Instant Copy paper, for use on Thermo-fax machines. . . .

Stewart Hoagland
Interchemical Corp.
New York

Pleasure, Not Chore

To the Editor: I'd like to convey to you and your staff a "pat on the back" for the fine job you are doing to make Chemical Week a business journal that is perused each week with anticipation, rather than one that goes into the "stack" for deferred reading, time permitting.

The liberal use of timely charts or graphs and concise writing style make reading more of a pleasure rather than a chore. Your sense for significant chemical developments adds a journalistic creative force to *CW*'s contents. And . . . your liberal use of eye-catching photographs adds that "living touch" to the news.

Kenneth R. Kern
President
Chemical Economic Services
15 Chambers St.
Princeton, N. J.

MEETINGS

American Nuclear Society, annual winter meeting, Mark Hopkins and Fairmont hotels, San Francisco, Dec. 12-14. Two highlights: talk on transuranium elements by Glenn T. Seaborg; and the Atom Fair, jointly sponsored by ANS and the Atomic Industrial Forum at the Masonic Temple, San Francisco, Dec. 12-16.

American Society of Agricultural Engineers, winter meeting, Palmer House, Chicago, Dec. 14-16.

American Assn. for the Advancement of Science. annual meeting, Philadelphia, Dec. 26-31.

American Chemical Society, 27th annual chemical engineering symposium of the division of industrial and engineering chemistry, Washington University, St. Louis, Mo., Dec. 29-30.

Instrument Society of America, winter instrument-automation conference and exhibit, Sheraton Jefferson Hotel and Kiel Auditorium, St. Louis, Mo., Jan. 17-19.

Society of Plastics Engineers, annual technical meeting, Shoreham and Park Sheraton hotels, Washington, D.C., Jan. 24-27.

Soap industry convention (soap, detergents, glycerin, fatty acids), Waldorf Astoria Hotel, New York City, Jan. 25-27.

National Assn. of Purchasing Agents, midwinter conference, Hotel Commodore, New York City, Feb. 1-2.

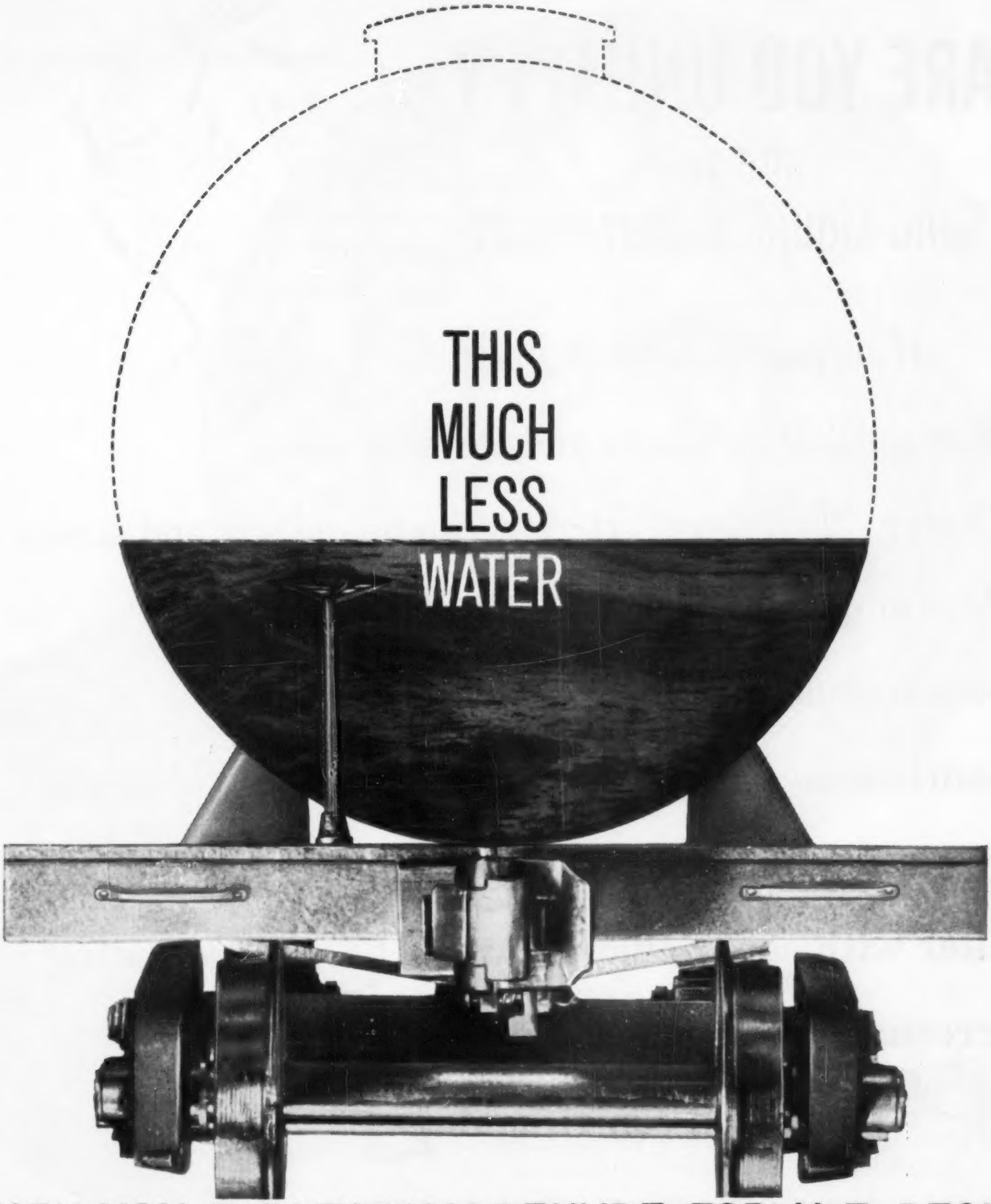
Parenteral Drug Assn., Inc., Statler Hilton Hotel, New York City, Feb. 3.

Pharmaceutical Manufacturers Assn., annual midwinter conference, Ambassador Hotel, Los Angeles, Feb. 20-21.

Technical Assn. of the Pulp and Paper Industry, annual meeting, Hotel Commodore, New York City, Feb. 20-23.

Petrochemical and Refining Exposition (first in U.S.), sponsored by American Institute of Chemical Engineers, Municipal Auditorium, New Orleans, Feb. 26-March 1.

American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, St. Louis, Feb. 26-March 2.



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For specifications and local offices, see our insert in Chemical Materials Catalog, pages 475-482 and in Chemical Week Buyer's Guide, pages 37-44.

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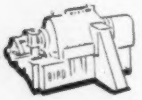
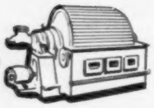
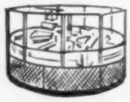
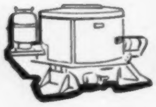
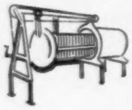
continuous screen centrifugal (and wash)  **drum**

type vacuum filter (and wash)  **pan type vacuum**

filter with super-efficient wash  **oscillating**

screen centrifugal  **pressure filter**

 **or batch centrifugal** 

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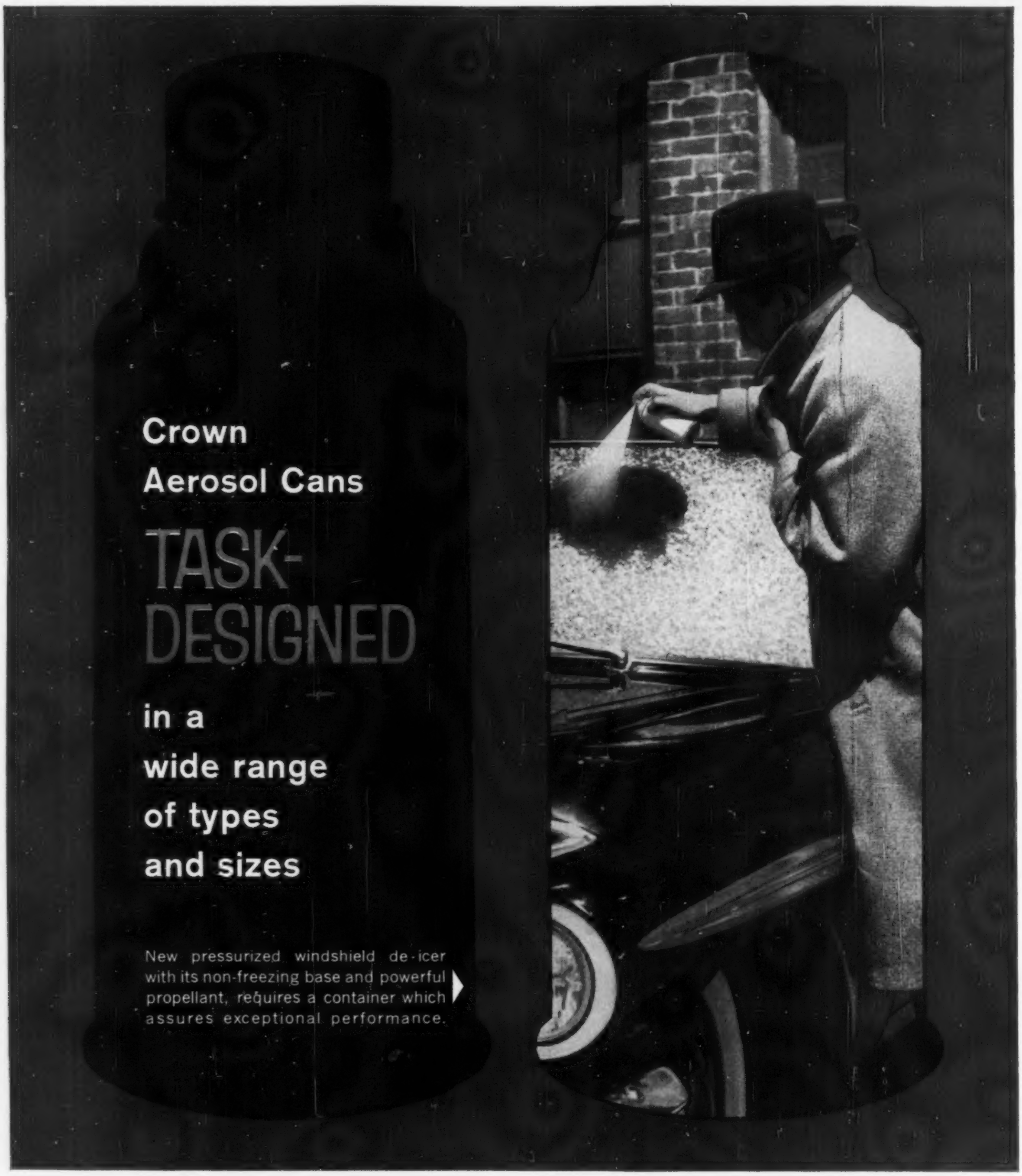
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Dimethylformamide (DMF) and dimethylacetamide (DMAC) are unusually powerful solvents for both organic and inorganic compounds and frequently demonstrate catalytic effects when used as reaction mediums. Many interesting new uses for DMF and DMAC as chemical intermediates are being discovered. Both are available in commercial quantities.

Catalyst and Reaction Solvent

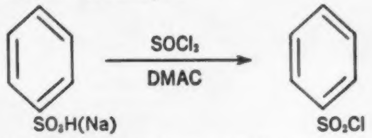
SUBSTITUTION REACTION . . . The catalytic properties of DMF are useful in many substitution reactions, such as in the preparation of phthalic acid derivatives, isocyanates from metal cyanates and organic halides, nitriles from alkyl halides and metal cyanides, and mercaptans using sodium hydrosulfide.

Another example of the use of DMF is in the alkylation of sodium acetylide with n-butyl bromide, where DMF has been found superior to all other solvents tried.

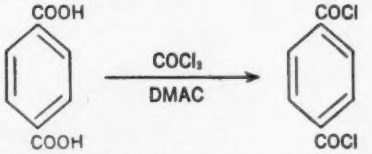
$$CH_3CH_2CH_2CH_2Br + HC\equiv CNa \xrightarrow{DMF} CH_3CH_2CH_2CH_2C\equiv CH$$

There are many other types of reactions where DMF contributes as a catalyst, such as the Ullman reaction, Gabriel condensations, polymerization, cyclization reactions and sulfonations.

PREPARATION OF ORGANIC ACID CHLORIDES . . . Organic sulfonic acids or their salts can be converted readily to the corresponding acid chloride in excellent yields by treatment with thionyl chloride or phosgene in the presence of DMAC or DMF as a catalyst.



And for converting certain carboxylic acids such as terephthalic and trichloroacetic acid—

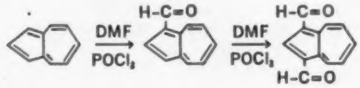


DEHYDROHALOGENATION... Many dehydrohalogenations are carried out smoothly using DMF or DMAC as a catalyst and solvent. For example, dehydrochlorination of 2-chloro-2-methylcyclohexanone to 2-methyl-2-cyclohexanone is easily carried out with DMF and LiCl.

An interesting example of DMF's utility is the selective dehydrobromination of 3-β-acetoxy-5-α-chloro-20-bromobisnorcholan-22-al with DMF despite the relative ease of dehydrochlorination.

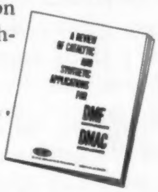
Applications in Organic Synthesis

The $POCl_3$-DMF complex is a low-cost formylating agent. An interesting example is the introduction of one or two aldehyde groups into cyclic organic molecules with DMF and $POCl_3$ or $COCl_2$.



New Chemistry Covered in Revised Booklet

Revised, up-to-date booklet is a compilation of the most important catalytic effects and synthetic applications of DMF and DMAC from over 180 sources. It details the use of these amides in: catalytic, synthetic, solvolytic, and analytical applications. Reference and patent coverage are detailed. Mail coupon for this valuable technical review.



E. I. du Pont de Nemours & Co. (Inc.)
Industrial and Biochemicals Dept., N-2539CW
Wilmington 98, Delaware

Please send me your new booklet on the catalytic and synthetic applications of DMF and DMAC.

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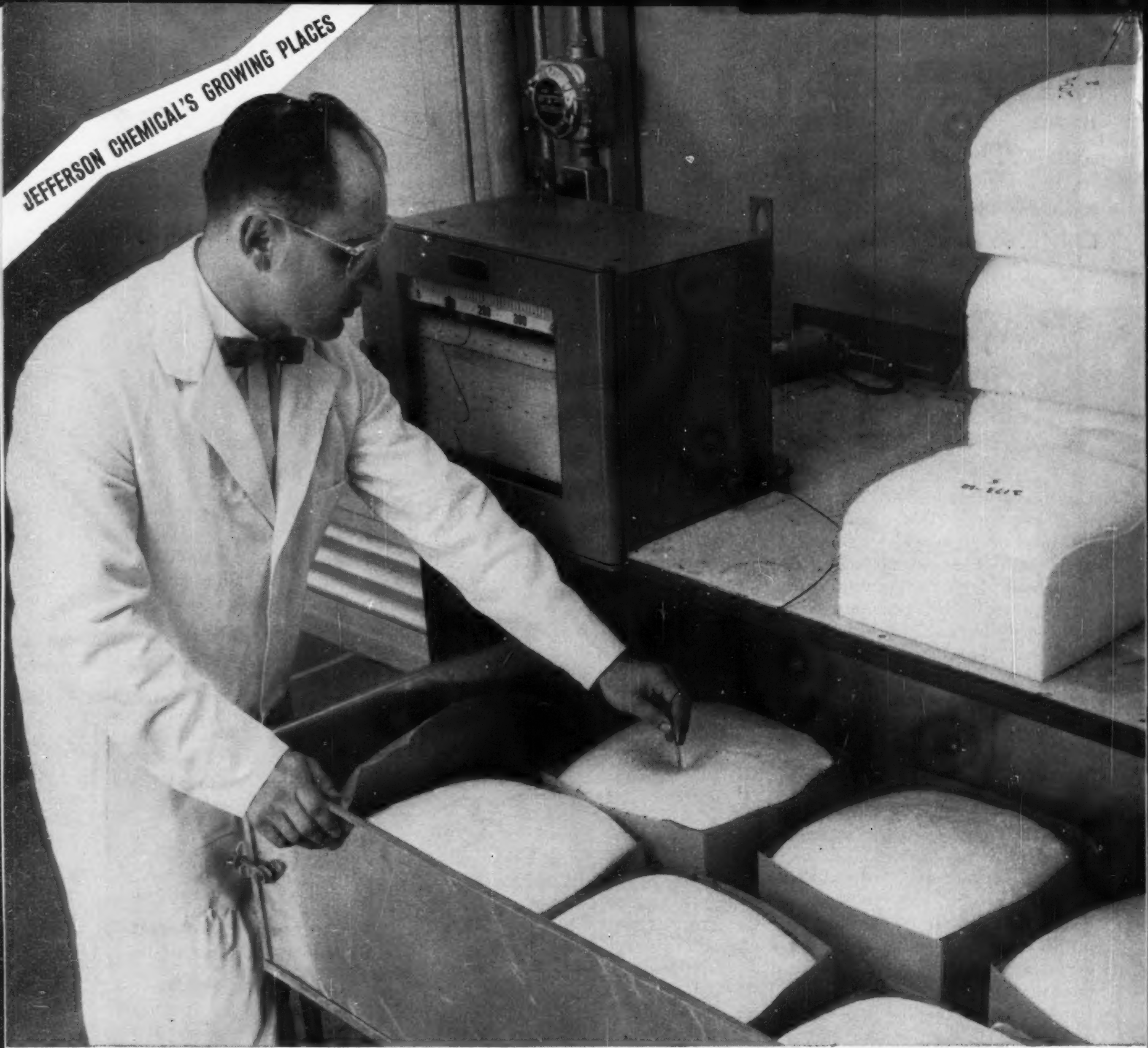


JEFFERSON CHEMICAL'S GROWING PLACES

Increasingly potent factor in petrochemical expansion plans: greater availability of low-cost LPG hydrocarbons via pipeline in many areas (*CW, Dec. 3, p. 21.*)

Newest development: rivalry over pipelining LPG material (mostly propane) from Texas and Louisiana through the Southeastern states. Last week a new contender for this business hove into view just as Trans-Southern Pipeline Corp. started construction of its $63-million, 1,080-mile LPG pipeline from Houston to Danville, Va. (*CW, Oct. 8, p. 39*). The new rival: a group of large LPG producers—including Phillips Petroleum, Union Texas Natural Gas Corp., and affiliates of Gulf Oil and Standard Oil of Indiana—whose plan is to build for only about $35 million a roughly parallel, 1,100-mile LPG pipeline into North Carolina. This line also would start near Houston, but would run perhaps 100 miles to the north of the Trans-Southern line, crossing the eastern part of Tennessee.

Only a week earlier Union Oil of California and Goliad Corp. (Houston) completed a $13-million joint venture that will increase LPG availability in Louisiana by 17,000 bbls./day.

•

Include Tennessee Gas Transmission in the petrochemical push along the Houston Ship Channel. Indications are strong that TGT will be in the picture supplying hydrocarbon feedstocks—still another sign of the natural gas industry's trend toward this kind of diversification (*CW, Dec. 3, p. 22*). Also, the company owns a big piece of land suitable for petrochemical plant sites on the channel, has big investments in gas pipelines and storage depots throughout the locality. Observers say Tennessee Gas is now seeking plant site-feedstock package deals with various chemical companies.

Within the past few months, Tennessee Gas has hired two veteran chemical executives: Frank Padgitt and Harry E. O'Connell, both of whom were with Ethyl more than 15 years. One of their tasks: work together on possible acquisitions. TGT already has two direct petrochemical investments—a 50% interest in Petro-Tex Chemical Corp. and a benzene-from-petroleum plant under construction at Chalmette, La.

Last week Tennessee Gas unveiled plans to make a substantial realignment in its corporate structure. Reason: to draw a sharper line between its regulated gas pipeline business and its nonregulated activities such as petrochemicals.

•

The first pharmaceutical company in the West Indies is now operating at Kingston, Jamaica. It's called Federated Pharmaceuticals Co.,

is turning out more than 21 items under its own label, in addition to a line of antibiotics that are being shipped from Lepetit (Milan, Italy).

•

Despite year-end doldrums that have hit the aluminum industry, a rosy picture has been painted for aluminum consumption in the next two decades. According to "Future of Industrial Raw Materials in North America," published this week (*also see Washington Newsletter, p. 52*) aluminum demand—with growth projected at 7.5%/year—is predicted to soar more than fivefold to nearly 7.8 million tons by '80.

But for right now, Kaiser Aluminum has shut down seven of its 17 potlines at Chalmette, La., and Mead, Wash., since last July. Aluminum Co. of America plans to suspend production on one potline at the end of this month following one earlier shutdown. Aluminum Ltd., closed two last month at its Arvida, Que., works. Reynolds Metals Co. plans a temporary halt in January of its Arkadelphia, Ark., plant—already running at 50% capacity.

In contrast, Ormet Corp. and Harvey Aluminum say they're continuing to turn out the primary metal at 100% capacity.

•

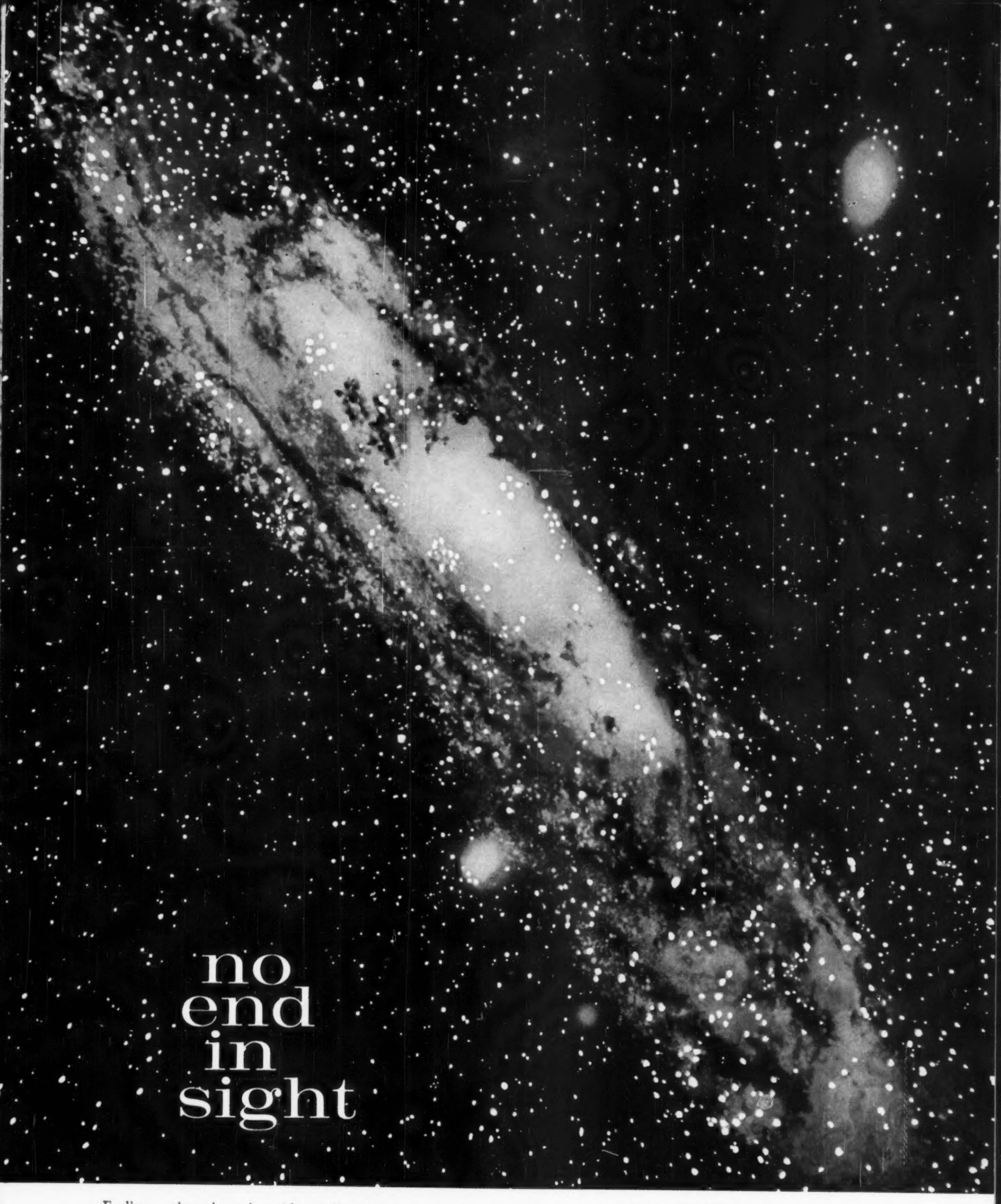
More major Soviet purchases of Western chemical technology and equipment are in the works. Russia is sounding out Western firms on whether they would help design and equip a big new chemical complex involving 10 different plastic film processes. The Russians want a single company to handle the entire deal, but participation by U.S. companies would probably be ruled out by our government; and observers doubt that any one European firm could handle the whole job.

Meanwhile, Britain's ICI is closer to a deal for selling polyethylene technology to the Soviets. Imperial Chemical Industries' Chairman Stanley Chambers was in Moscow last week discussing this and other deals (*see p. 27*). ICI has been selling chemicals and plastics to Russia (Chambers hopes sales will double in two or three years), but this would be its first technology sale. All told, ICI is trying to sell about 20 processes to Russia.

ICI may buy Soviet technology for making "kaprolactron," a nylon raw material, Chambers told reporters in Moscow last Friday. While ICI for the moment expects to do much more selling than buying in the Soviet Union, Chambers said it may well be that in future years the reverse will be true. Western commercial sources in Moscow are skeptical that ICI would buy the Soviet kaprolactron process; they believe that Chambers may be using the proposal as a bargaining point for his own sales efforts.

•

Montecatini plans to spend $480 million in capital investments during the next four years, President Carlo Faina told *CW*'s Milan correspondent. Included in the plans: a plant in Ferradina (central Italy) to convert into plastics some of the natural gas found there by the state-owned company, ENI; and a 120,000-metric tons/year aluminum plant.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end
in
sight

Versamid®-based coatings add sparkling beauty and long life to **Grumman 'Gulf Stream'**

To protect the skin of its new turbo-prop executive aircraft, Grumman Aircraft Engineering Corporation sought a coating that could be easily applied, would retain its brilliance, and was both tough and resilient. A coating formulation based on General Mills' Versamid and epoxy resins proved the answer. The chemical reaction of these two resins, at room and elevated temperatures, produces a new durable copolymer with outstanding properties. Impact resistance of 170 in.-lbs. is readily obtained to take the punishment of 350 mph. cruising speed . . . plus outstanding chemical and abrasion resistance. Versamid-based coatings are resilient and flexible even at reduced temperatures. And importantly, they exhibit tenacious adhesion qualities.

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Grace's Winne, Miller: Gambling that linear polyethylene markets will rise faster than capacity.

Betting Big on a Linear PE Boost

Major linear polyethylene expansions are coming, despite talk of overcapacity, uncertain prices, and a major battle with polypropylene — the polyolefin challenger that has just begun to fight. At stake: major new plastic markets now opening up.

Hercules Powder Co. will double its linear polyethylene capacity at Parlin, N.J., about the beginning of February of next year. The extra capacity will be drawn from present polypropylene capacity at Parlin, which will be replaced by Hercules' first polypropylene unit at Lake Charles. The latter is due to go onstream early next year.

A small amount of polypropylene will continue to be made at Parlin, at least until the Lake Charles plant goes into full-scale production. (Like the Parlin plant, the Lake Charles unit is designed to produce both polypropylene and linear PE.) Parlin's combined PP-PE capacity is about 60 million lbs./year.

At the same time, W. R. Grace is expanding by 50% linear polyethylene capacity at its Baton Rouge, La., plant (*CW Business Newsletter, Dec. 3*). This will give Grace linear PE capacity of 60-75 million lbs./year, depending on the exact products made.

Over-all U.S. linear PE capacity exceeds present demand. Capacity is estimated to be well over 300 million lbs./year now. Sales for 1960, projected from nine-month Dept. of Commerce figures (for plastics by the "low-pressure method"), will be 166 million lbs. Projection to '65 finds a narrowing of the gap; '65 sales forecast: as high as 625 million lbs./year; '65 capacity: as low as 650 million.

Grace, backing up its conviction with money, is more optimistic. "I believe the markets will exceed the industry capacity in another couple of years," says Grace Polymer Chemicals Division President Ted Miller. Adds Elwyn E. Winne, vice-president of the Polymer Chemicals Division: "Published capacity figures are overstated: they're all talking about making the simplest types. When you try to make different melt-index materials, and other different grades, capacity goes way down."

Grace expects '60 linear PE sales of 180 million lbs. Moreover, in '61 and each year for several years thereafter, Grace expects high-density polyethylene sales to increase by 60% annually, against an increase for polyolefins in general of 15-20% annually.

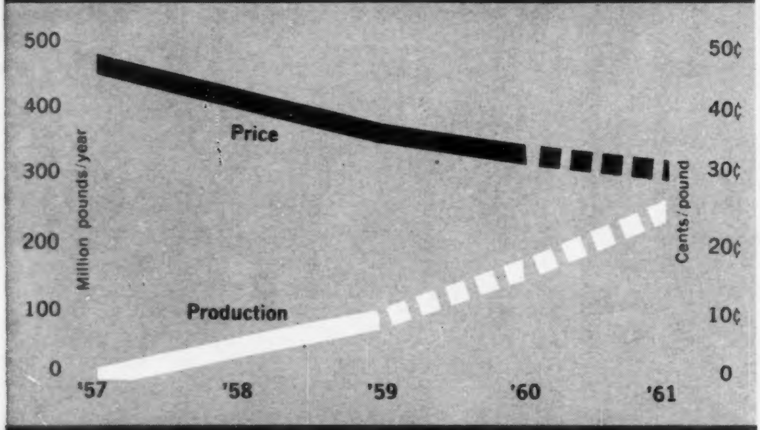
Conservative estimates see a combined market of 800-900 million lbs./year for polypropylene and linear PE in '65. Most prognosticators believe the two plastics will take equal shares of the market, whatever size it may be.

Competition among the polyolefins is expected to grow fierce as big new markets develop and as polypropylene arrives in force. Large investments in molds must be made for both linear PE and polypropylene. And the molds will not be interchangeable—different plastic physical characteristics require different product designs. A molder who has made a choice between the two plastics is not likely to change soon thereafter. Market development work right now, therefore, is all-important.

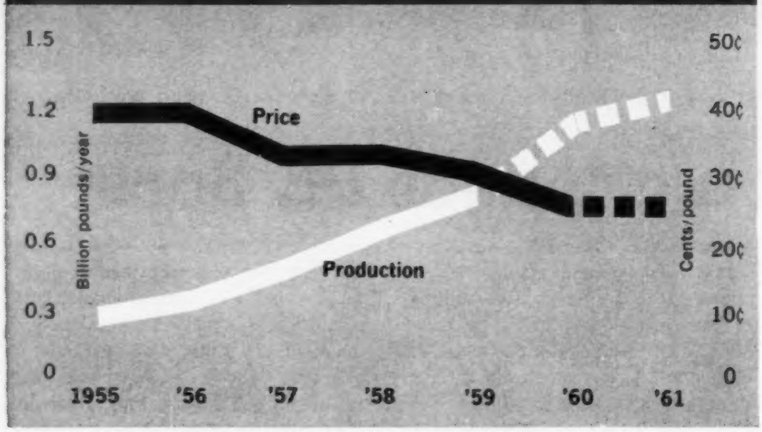
Biggest market foreseen for linear PE is in packaging, particularly blow-molded bottles. Liquid detergents are now 75% in polyethylene — either rigid (linear) or flexible. Next big market is expected to be liquid bleaches. Procter & Gamble is reported to have sent teams to various polyethylene plants to explore feasibility of a linear PE container.

One producer's estimate as to how the polyolefin markets will grow (all figures in millions of pounds):

High-Density Polyethylene: Growing Strong



Low-Density Polyethylene: Demand Levels Off



Application	*Low-Dens. PE*	*Linear PE*	*PP*
Inject. molding	110	40	15
Bottles, tubes	30	20	2
Pipe, shapes	53	17	0.5
Films	315	16	5
Sheeting	2	4	0.5
Wire, cable	115	5	—
Coatings	72	3	1
Misc.	22	13	4
Export	180	20	—
1960 totals	*899*	*138*	*28*

Application	*Low-Dens. PE*	*Linear PE*	*PP*
Inject. molding	125	85	40
Bottles, tubes	35	50	15
Pipe, shapes	58	27	5
Films	425	42	55
Sheeting	5	8	5
Wire, cable	160	20	5
Coatings	110	15	5
Misc.	27	22	12
Export	95	20	5
1963 totals	*1,040*	*289*	*147*

Among major markets the polyolefins will vie for are pipe, frozen-food containers, soda pop cartons, housings and other parts for electrical appliances. Still other promising outlets: autos, office machines.

Linear PE makers are most enthusiastic about the bottle market, are jockeying for position there. Celanese, for one, is integrating forward by acquiring plastic bottle makers as well as other plastics concerns (*CW, June 4, p. 25*).

Also important: getting a full line of polyolefins so they can be mixed, tailored to end-use.

But opening the big markets is slow. A large user does extensive testing before making a switch, so the first big sale can take from two to five years. Small buyers usually make the jump first. They can move faster, have less at stake, and are constantly seeking new sales points to attract customers from their large competitors.

On one score, most producers agree: linear polyethylene has begun to be sold on its own merits, rather than as a low-cost substitute for something else. On this basis, high-density PE now seems likely to maintain its '60 growth pace for several more years, despite the expected onrush of polypropylene.

Same End, Any Means

In latest maneuvering before the case comes before the U.S. Supreme Court (possibly next spring), the Justice Dept. is taking a slightly broader stand on the Du Pont-General Motors antitrust suit.

The government is still demanding "effective divestiture within a reasonable period," maintaining that Du Pont's continuing ownership of about 23% of GM's outstanding common stock is not compatible with the country's antitrust laws (*CW, June 4, p. 24*).

But in a new, 83-page brief filed with the Supreme Court last week, the Justice Dept. seems to stress the flexibility in its position and to suggest new approaches to the problem of carrying out the divestment without wreaking too much economic damage on the companies and stockholders concerned.

Although the brief includes an extensive discussion of how Du Pont and the GM stock could be parted, the Justice Dept. says it is not trying to cover "all possible methods."

One of the government's proposals: that Du Pont could exchange the GM shares for its own outstanding common or preferred shares. Under this scheme, holders of Du Pont stock could turn some of their shares over to Du Pont, which would pocket such stock as treasury shares and send out GM stock to its shareholders. This would appreciably alter Du Pont's capitalization structure.

Du Pont—which now has 60 days in which to file a reply to the brief—declined to comment on the document. Up to now, Du Pont has favored the plan decreed by the district court in Chicago: that Du Pont would continue to own the GM shares and receive the dividends, but that voting rights on those GM shares would pass on to Du Pont's stockholders.

Six to Grow On

Heyden Newport Chemical Corp. seems to be sitting pretty for '61. With six new plants—two onstream since last month and four more due for completion within the next three—it expects to "fare better proportionately than the chemical industry as a whole" next year.

Only "possible but unanticipated" trouble next year—such as heavy startup expenses or a serious dip in the over-all economy—could change the picture, says HN's President Simon Askin. He is confident that both sales and earnings will make "substantial gains" over '60 levels.

And the '60 levels are high—an estimated 9% higher in sales and 30% higher in earnings than last year—largely because of the currently strong market for rosin (*see p. 115*). Now the firm is pushing an expansion program involving expenditures of more than $6 million this year and probably $5 million next year.

Chemicals, Naval Stores: In November the company started up new units designed to double capacity for derivatives of *o*- and *p*-chlorotoluene in its Heyden Chemical Division plant at Fords, N.J. Also last month HN's Mexican subsidiary, Resinera del Tigre, began operating its new gum rosin and turpentine plant at Guadalajara.

This month, Nuodex Products Co. division is planning to start up its new plant at Elizabeth, N.J., for production of a nickel catalyst used in hydrogenation of fats. In mid-January the Newport Industries Co. division is scheduled to begin running its new tall oil fractionation plant at Oakdale, La., with crude tall oil input capacity of 24,000 tons/year. (The division's first fractionation plant, at Bay Minette, Ala., has 36,000-tons/year capacity.)

And the chemical division hopes to complete construction in February of two major projects: a 12-million-lbs./-year benzoic acid and sodium benzoate plant at Garfield, N.J.; and a 24-million-lbs./year maleic anhydride plant at Fords.

Upgrading Own Products: Speaking to New York financial analysts last week, Askin indicated that his company's preferred growth route is via further upgrading of its own products—particularly naval stores products.

Heyden Newport's Askin: Growth via upgrading of naval stores.

"We regard our beginning position in rosin and turpentine and terpene chemistry generally as a distinctive 'building block' position," Askin declared. "We are not alone in this field, but certainly there are relatively few major competitors and it is quite doubtful that new producers will emerge at the production level."

As recent attainments in this area, he cited the company's rubber emulsifiers, derived from rosin; Strobane insecticide, produced by chlorination of two constituents of turpentine; and Beta S epoxy curing agent, produced from a turpentine derivative and maleic anhydride.

Askin listed six principal prospective growth areas for Heyden Newport: agricultural chemicals, sold through established distributors; synthetic lubricants, including TP653B for a Mach 3 jet plane; paper chemicals, such as paper size and slimicides; rubber chemicals ("We expect to offer a new antioxidant in the coming months and have reasonable hopes of shortly following that with a new antiozonant"); metallic salts, especially nickel catalysts; and additives for plastics and protective coatings ("Nuodex Division is, we think, fairly close to offering commercially a needed nonmercurial paint fungicide").

Askin noted that, although rosin prices are up, prices of turpentine and fatty acids have declined.

Methacrylate Entry

One of the industry's biggest question's—"Who will become the third commercial producer of methacrylates?"—was answered this week as Escambia Chemical (New York) revealed plans to build a commercial-size unit.

Escambia has been looking at the methacrylate market for about 10 years. It has been concentrating on perfecting its new process, which starts with isobutylene and nitric acid. (Du Pont and Rohm & Haas use acetone and hydrogen cyanide as raw materials.)

Searching for a Site: While the site has not been decided, Vice-President A. N. Wohlwend says three areas are now under consideration: Pensacola, Fla., site of the company's 500,000-750,000-lbs./year semicommercial methacrylate works and captive source of nitric acid and methanol, another acrylate raw material; the Gulf Coast; and northern U.S., particularly the area between New York and Chicago. Construction of the multimillion-pounds/year unit will be started about the middle of next year, Wohlwend adds, and will take about 12-18 months to complete.

Wohlwend reports that the new process has attracted interest among a number of foreign companies, particularly those in Europe and Japan. He says his company is interested in either licensing or joint venture arrangements with overseas companies.

Bigger Sampling Set: In addition to methacrylic acid and its esters, says Earl Lane, new-products manager, the company will also be offering α-hydroxyisobutyric acid from the proposed commercial unit. These products have all been produced at the semicommercial unit at Pensacola, but sampling has been done on only a limited scale. Now, the company is prepared to offer developmental quantities of these products.

Particularly encouraging, says Lane, are the test results from several producers in the molding and casting field, who report Escambia's material equivalent to material already on the market.

Other companies that have been mentioned as possible producers of methacrylates: American Cyanamid and Monsanto Chemical (*CW, Oct. 29, p. 109*).

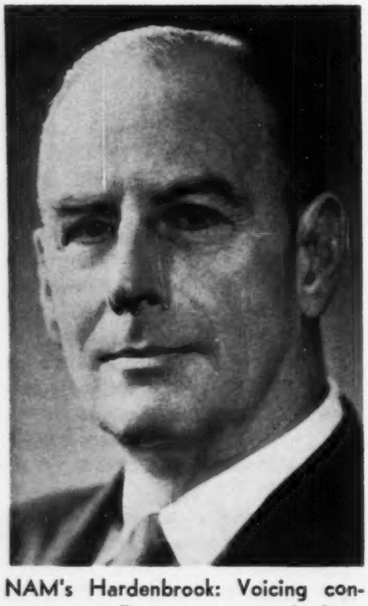
Pollution Clashes Coming

Clashes between go-slow and move-fast factions are expected to strike sparks in next week's National Conference on Water Pollution (see p. 37).

Most industry delegates will be executives with heavy corporate responsibilities and community obligations in large-scale waste disposal situations. Within the government contingent there will be a number of Democratic Congressional leaders who feel that committee hearings have already brought out what needs to be done, that now's the time for action (*CW Washington Newsletter, Dec. 3*).

The conference—first of its kind—is to be held Dec. 12-14 in Washington's Sheraton-Park Hotel, with an expected registration of about 1,500. Industry specialists will include George Best of the Manufacturing Chemists' Assn. and Donald Hardenbrook of the National Assn. of Manufacturers. The parley is officially aimed at "reaching substantial agreement on a set of national goals" to curb water pollution and "setting forth specific programs" to meet these goals as a guide to the new Administration and the 87th Congress.

Political Angles: However, the conference will be meeting under the sponsorship of a "lame duck" Administration—a factor that diminishes its value in the eyes of Democrats who will be the key men on pollution-control legislation in the next Congress. They recall that the conference was called by President Eisenhower last spring just after he vetoed their bill that would have doubled federal grants for construction of sewage treatment plants.



NAM's Hardenbrook: Voicing concern on pollution costs, methods.

The Democrats do see one big value in the conference: a good way to inform and arouse industry to the need for speedy action. They have already drafted a bill, in fact, providing for governmental action. The more modest recommendations that they expect industry representatives to offer will not change their plans.

For Shifting Jurisdiction: One topic that appears certain to be controversial is the proposal to take interstate water-pollution problems out of the jurisdiction of the U.S. Public Health Service. Proponents say that water pollution is no longer primarily a health problem; few communities are unable to obtain enough good drinking water. The problem now, according to this view, is one of fully utilizing available water resources as industries and cities pour more and more waste products of all types into major streams.

Conservation-minded congressmen feel that as long as pollution is considered mainly a health problem under the purview of the Surgeon-General of the PHS, it will not get the attention it deserves as a broad problem of resource utilization.

Waiting for Ribicoff

Two new CPI problems for that office accompanied last week's designation of Connecticut Gov. Abraham A. Ribicoff to fill the post of Secretary of Health, Education and Welfare in the Kennedy Administration.

First, it became clear that oral, live-virus polio vaccine will probably not be available in substantial quantities for next summer's polio season, as had been anticipated.

Second, a new Food and Drug Administration order on food additives—this one banning certain soft drink flavorings—points up the problems existing between that agency and some areas of the CPI. Safrole and oil of sassafras—found to have caused cancer in rats—were added to FDA's list of prohibited additives. A survey showed that neither was still being used, however.

Contrary to the common belief that the oral Sabin polio vaccine is "just around the corner," much time and testing still stand in the way of commercial quantities of the vaccine. Lederle Laboratories (Pearl River, N. Y.) doesn't expect full-scale production until fall or winter of '61—and it doesn't know of any other producer-to-be that is ahead of that schedule.

Before any vaccine can be turned out in commercial quantities, industry sources say, Public Health Service regulations published only last month must first be clarified. More testing must follow, and finally techniques for production on a volume basis must be worked out.

It is becoming clear, also, that the Sabin vaccine will not be the "cheap vaccine" it has been heralded to be. Because of the very nature of the live-virus ingredients, it is difficult to make and many batches will probably have to be rejected. So when it does appear in commercial quantities—probably by '62—it could still face stiff competition from the existing injection-type Salk vaccine.

Alumina's Offshoots

Aluminum chemicals are continuing their growing ways. By mid-'61 two aluminum-based plant projects will be under way, and two more are already under construction. Newest expansions are in aluminum fluoride, activated alumina and alum.

North American Coal Corp. will complete the first part of its tentative three-stage aluminum program next July with completion of its alum plant under construction near its Powhatan mine in Ohio (*CW, June 4, p. 24*). That step will enable the coal company to produce alum from coal-mine waste. Second and third phases—still under study—are for producing aluminum oxide and then the metal from the oxide.

Due in Feb. '61 is Stauffer Chemical's liquid aluminum sulfate plant at Counce, Tenn. Joining seven other Stauffer alum plants, this one—being built adjacent to Tennessee Pulp and Paper Co.'s new paper mill—will be Stauffer's first in the Southeast.

Kaiser Aluminum & Chemical Corp. will build a $1.4-million aluminum fluoride plant at its Gramercy, La., works in a move aimed at "integrating its sources of important raw materials." Kaiser had been buying its aluminum fluoride requirements, but with the new plant set for completion in third-quarter '62, the company will produce its own material from fluorspar and sulfuric acid shipped to Gramercy and from its own alumina hydrate.

At about the same time, Kaiser expects to have onstream at Baton Rouge, La., a $700,000 plant that will boost its active alumina capacity fivefold. The new unit will produce a high-surface-area, spherical-shaped active alumina that is being used in the chemical and petroleum processing industries.

Only last summer two Canadian aluminum chloride plants — affiliated with Allied Chemical (New York) and Clinton Chemical (Phillipsburg, N.J.) —went onstream.

Another Race in Mexico

Mexican consumers of fluorinated hydrocarbons are looking forward to a glutted market—the result of two U.S.-company-backed projects now in the works, each with capacity to fill the country's needs.

The situation, reminiscent of the recent Monsanto-Hooker battle for tripolyphosphate dominance, began shaping up last summer. At that time Allied Chemical granted Celulosa y Derivados a license for the technology and its Genitron brandname to build a hydrofluoric acid and fluorinated hydrocarbon plant in Monterrey (*CW, June 30, p. 22*).

The move apparently squeezed out Du Pont, which supplies most of the Mexican market from the U.S. It had been talking for two years about building a plant but had reportedly run into snags getting the raw material—hydrofluoric acid. Its acid source was to be Fluor-Mex, an affiliate of Stauffer Chemical, but the former couldn't take on a new customer.

Fluor-Mex, however, had already started building a new, larger acid plant when the Allied deal broke, and last week it became clear that Stauffer and Du Pont don't intend to let the market slip from their hands. Stauffer revealed that another of its Mexican affiliates, Industrias Quimicas de Mexico, other Mexican investors, and Du Pont are going ahead on building of fluorinated hydrocarbon and carbon tetrachloride plants. The group has formed a new company, Halocarburos S.A., which will build the plants on the Industrias Quimicas site in Santa Clara. Du Pont holds 25% interest, will supply its Freon trademarks and technology.

Both the Allied-Celulosa and the Stauffer-Du Pont groups are racing to be onstream at midyear.

Freeing the Peso

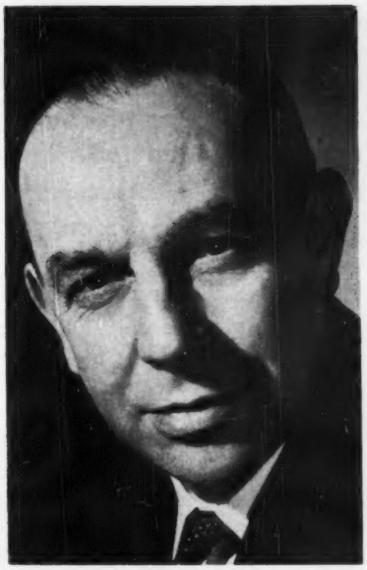
Prospective foreign investors in the Philippines got more encouragement last week as the government swung into the second phase of its economic decontrol program.

The new phase is essentially two long steps in a long route toward completely freeing foreign exchange controls. The program is designed for completion by '64, at which time the peso will have been allowed to find its level on the world market. This amounts to a gradual devaluation.

Under part one of the latest ruling, foreign investors get a break. They can now "buy" all of their pesos at the free market rate of 3 pesos/-dollar. Previously, they paid for two-thirds of their investment at the official rate, receiving only 2 pesos/-dollar.

Part two of the new ruling applies to the Philippine businessman doing business with foreign countries. It extends a decontrol step begun last spring by the Central Bank, a ruling that allowed 25% of a foreign trade transaction to be exchanged at the free market rate. In last week's move, 50% of the transaction is allowed at this rate for most products. Philippine exporters are especially happy with the move, since it means the Central Bank will pay them more pesos for the foreign exchange they earn. For importers it means higher costs, though the government took out some of the sting by reducing the foreign exchange tax from 25% to 20%.

Actually, most Philippine businessmen are happy with the decontrol moves since they should lead to an eventual cut in red tape, graft and restrictions on private enterprise.



ICI's Chambers sees major chemical markets opening in Soviet bloc.

Missions to Moscow

The contrast in U.S. and British attitudes toward selling chemicals to the Soviet bloc is neatly symbolized by two recent visits to Moscow—by S. P. Chambers, chairman of Britain's Imperial Chemical Industries, and by a team from the U.S. Information Agency.

The USIA team has been discussing with Russian officials booking of a U.S. plastics exhibition for the Soviet. It probably will be held in Moscow and other cities next spring.

The U.S. government-sponsored show is the result of a "cultural agreement" signed last year. U.S. companies will be asked to lend materials for display, but the purpose is strictly noncommercial. It will show various uses of plastics in home and industry, industrial processes and methods of making plastic materials.

Last June Imperial Chemical Industries staged its own plastics show in Moscow (*CW, June 18, p. 45*). Unlike the planned U.S. show, however, it was strictly commercial.

Chairman Chambers followed it up last week with a personal visit to talk with Soviet leaders at their invitation. ICI's sales to Russia will likely rise from '59's $5.6 million to $8.4 million this year. Sales to the entire Soviet bloc rose from $5.3 million to $9.5 million last year.

rapid roundup

Rounding out the week's news of companies, expansions, and foreign developments.

companies

Fansteel Metallurgical Corp. (North Chicago, Ill.) has reorganized its chemical and metals fabrication divisions into one operating Chemical and Metallurgical Division. According to Fansteel, the company is getting set to "become more active in the chemical industry."

Dow Chemical Co.'s proposed acquisition of Allied Laboratories (Kansas City, Mo.) is now set for Dec. 30 following a green light last week from Allied Laboratories stockholders. The deal calls for issuing two-thirds of a share of Dow stock for each share of Allied Laboratories stock (*CW, Sept. 10, p. 31*). Dow says the pharmaceutical company will continue to operate under its present officers as a division.

Bzura Chemical Co. (Keyport, N.J.) and its principal stockholders have shares of common stock on the market, with the biggest part of net proceeds slated for expansion of fumaric acid production (*CW, Sept. 10, p. 34*). Of an expected net to the company of $3.2 million, $900,000 will go to cover startup expenses of the company's citric acid plant at Fieldsboro, N.J., and $500,000 will be spent to expand itaconic acid research and pilot-plant facilities.

Copolymer Rubber & Chemical Corp. (Baton Rouge, La.) will occupy new administrative offices late next year following completion of a $750,000 building at Baton Rouge.

expansion

Benzene: Texas Co. and its affiliate, Texaco Canada, Ltd., are pushing benzene-from-oil expansion. Besides Texaco's 30-million-gal./year plant going up at Port Arthur, Tex. *(CW, Aug. 13, p. 42)*, the Canadian firm is building a $2-million benzene and toluene facility at Port Credit, Ont. The plant will have an initial throughput of 1,500 bbls./day, will produce xylene and ethylbenzene in the future.

Sensitized Film: Dynacolor Corp. (Rochester, N.Y.), less than a year after opening a new plant, will add a $750,000 manufacturing and research extension to the photographic film and paper facility. With sales booming upward from less than $200,000 to $18 million in six years, Dynacolor leased a nearby building to take up the work load until its addition is completed. It will keep the leased structure as a warehouse and supply point after its expanded plant opens next spring.

Carbon Dioxide: Publicker Industries, Inc. (Philadelphia) will build a $5-million carbon dioxide gas recovery plant at Philadelphia. The company will use CO_2 separated and purified from flue gases at its main steam plant nearby to manufacture liquid carbon dioxide and dry ice.

Oxygen, Cement: Canadian Liquid Air Co. (Montreal, Ont.) has announced plans for a $2-million addition to its oxygen plant at Hamilton, Ont.

Also in Hamilton: El Chem Engineering & Manufacturing Co. (Emmaus, Pa.) has bought a seven-acre site to put up an acid-alkaliproof cement plant.

foreign

Resins, Adhesives/Australia: National Starch and Chemical Corp. (New York) and Jordan Chemical Works (Australia) Pty. Ltd. (Sydney) have formed a jointly owned subsidiary to produce National's line of vinyl polymers and adhesives at Jordan's plant.

Polyvinyl Chloride/Italy: Rumianca, S.p.A. (Torino) will build a $3-million, 10,000-metric tons/year polyvinyl chloride resin plant at Pieve Vergonte, near the Swiss border. It's due onstream in mid-'62. Technology and engineering will be supplied by U.S. Rubber, under an agreement that gives Rumianca patent licenses for use and sale of the products outside the U.S.

Ammonia/Lebanon: A group of Lebanese businessmen are reportedly forming a company to build an ammonia plant near one of Lebanon's two oil refineries. They seek foreign know-how and financial participation, but will settle for a turn-key contract.

Polypropylene/Japan: The Japanese government has finally approved Montecatini's polypropylene licensing agreements with Mitsui Chemical Industry Co. and Mitsubishi Petrochemical Co., after the Italian company granted better terms than in the original contracts. Both Japanese companies plan to build 10,000-tons/-year plants, and to export at least half the output as finished products.

Red Aid/Cuba: Soviet technicians may help run the Nicaro nickel plant, which Cuba nationalized after the U.S. government shut it down. Ammonia for processing and spare parts would also come from Russia. China, meanwhile, has decided to strain its own limited resources and grant Cuba a $60-million, interest-free five-year loan.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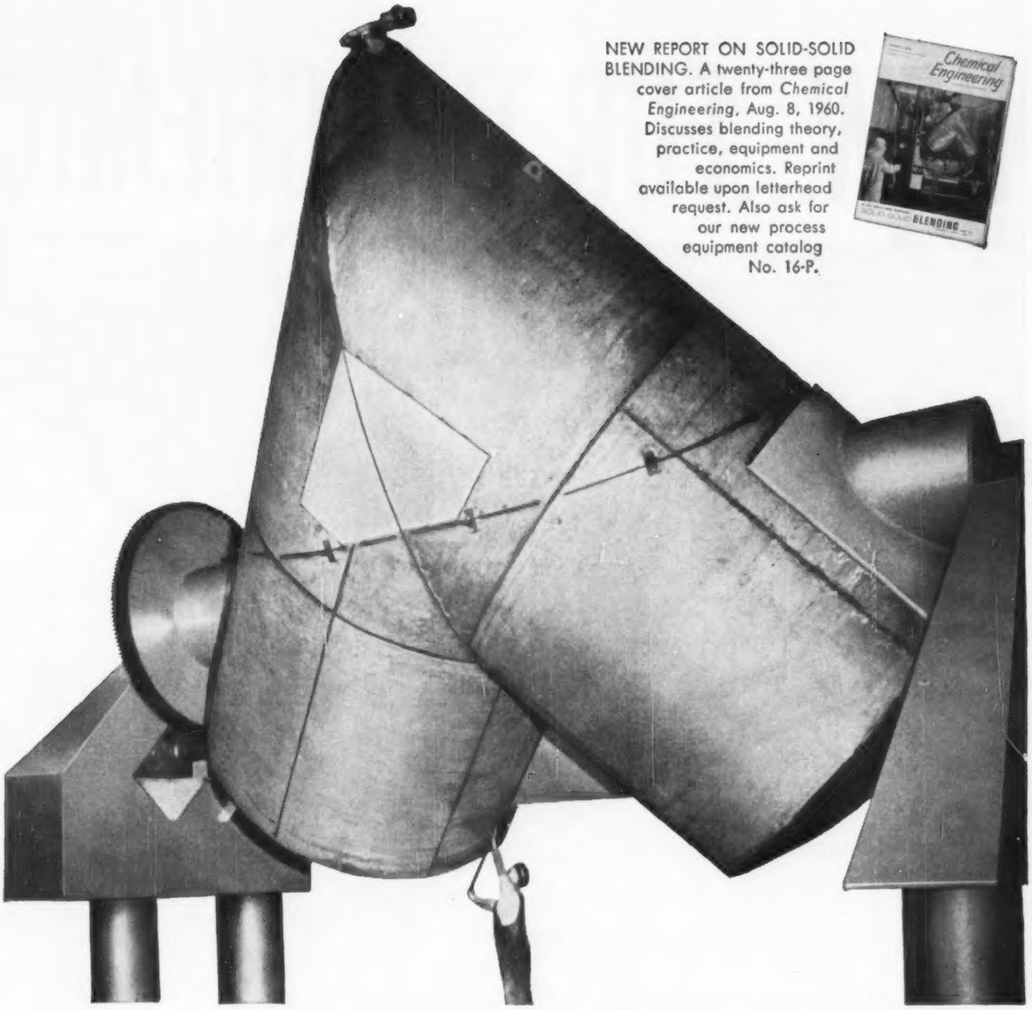

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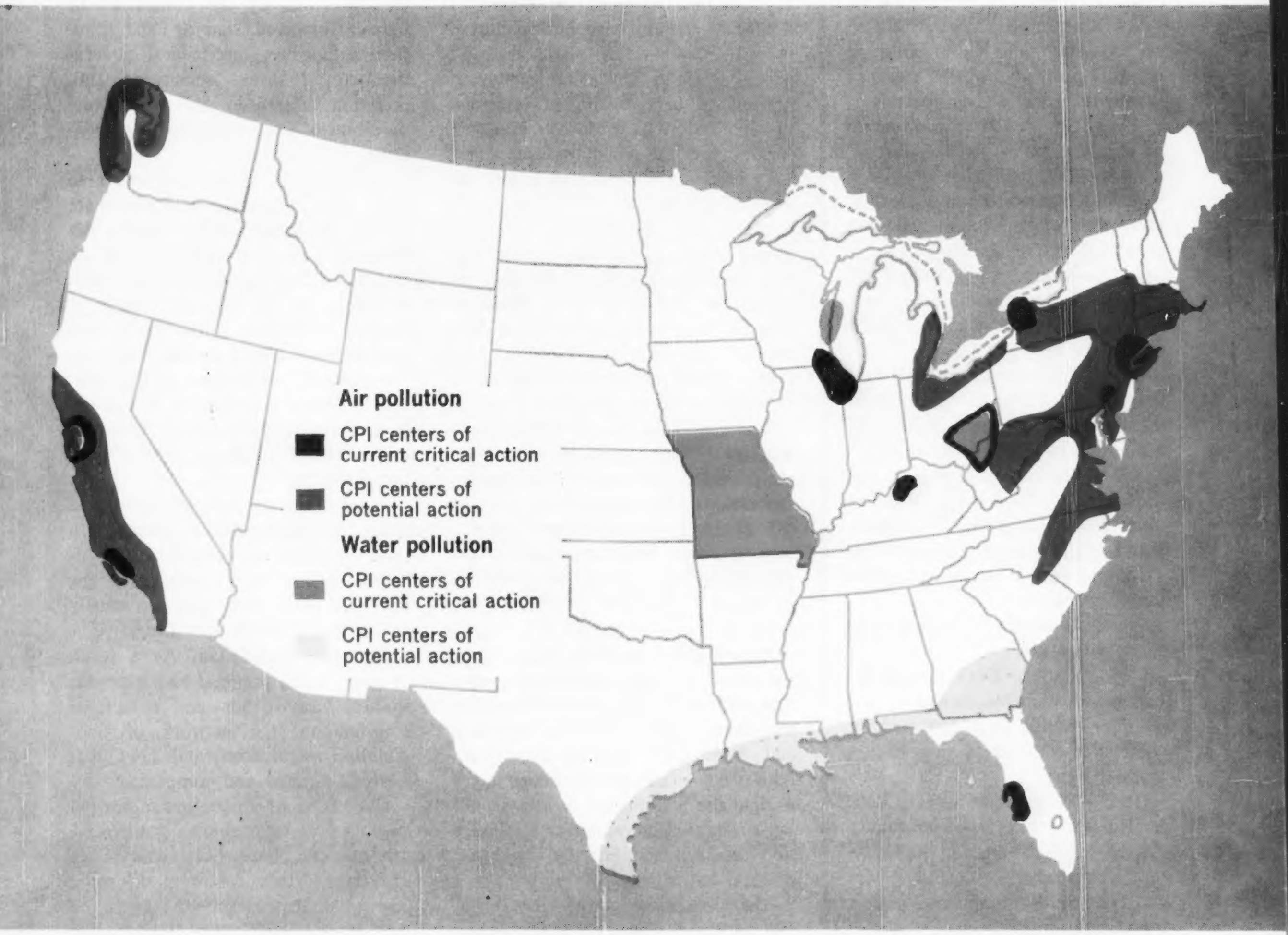

PUGET SOUND: new local regulations. SAN FRANCISCO BAY AREA: new implementation and enforcement of existing air-pollution laws; new cleanup action started on water pollution. LOS ANGELES: heavy regulation of air pollution, revision of existing laws possible; water-pollution studies being made, new local regulations expected. WISCONSIN WATERWAYS: studies under way, regulation possible. GREATER CHICAGO AREA: lagging investigation of continuing bad situation. MISSOURI: federal court action under way, statewide studies in progress. LOUISVILLE: studies completed, new legislation enacted. UPPER OHIO VALLEY: nation's heaviest pollution area; federal action possible. NIAGARA FRONTIER: thorough studies under way, strong local legislation expected. GREATER NEW YORK AREA: stricter legislation of air pollution, enforcement probable; stronger local enforcement due on water pollution. PHILADELPHIA AREA: new policing agency formed. FLORIDA PHOSPHATE AREA: Public complaints, variety of studies being made.

Mapping the Antipollution Outlook

Next week 1,500 representatives of government and industry—including a number of top chemical industry men—will meet in Washington, D.C., to review the water-pollution problem in the U.S. and share in developing new national agreements on pollution-control policies.

Despite "so what" questioning from certain Congressional Democrats (*CW, Dec. 3, p. 36*) about the value of the U.S. Public Health Service conference, sponsors and participants expect to reach substantial agreement on a set of national goals to curb pollution. They are also likely to propose specific programs needed to achieve these goals for consideration by the new Administration and Congress. And in addition, the conference will serve to underscore the strides industry has made in battling pollution, should give a clue as to what definite directions enforcement will take.

Dirty Water, Dirty Air: The map shown above may well be considered a CPI battle map, showing the areas of current and probable future conflict in the war chemical processors are waging against pollution. Unfortunately, chemical companies too often are winning the battles and losing the war through faulty public relations, not letting the public know what is being accomplished.

Industry has made great advances

DIMENSION— Louisville's Story

An illustration of the evolution of a community's air-pollution control problem is the case of Louisville, Ky. It goes like this:

1946—Smoke Commission set up to pinpoint major smoke sources.

1951—Louisville Air Pollution Control Commission formed (essentially the Smoke Commission with expanded responsibilities).

1952—Kentucky legislature passed enabling act, authorizing establishment of county-wide pollution-control bodies.

1952—Jefferson County Air Pollution Control District (encompassing Louisville) formed, decides on need for more conclusive studies.

1952—Companies at western end of the county formed the "Rubbertown Industrial Group," contracts with Battelle Memorial Institute for a comprehensive survey of air-pollution problems.

1953—Battelle's experimental work completed.

1954—Battelle work termed inconclusive; data insufficient.

1955—Public Law 159 (federal support to community air-pollution studies) signed.

1955—Plans made by U.S. Public Health Service and Community Air Pollution Program to do $150,000/year study.

1958—Study completed, recommendations made.

1959—Jefferson County commission makes recommended rules.

1960—Companies comply with regulations; commission says air pollution is reduced but general public remains unconvinced.

CPI Affected: There are several examples of what Louisville's CPI did in this antipollution drive. Du Pont's neoprene plant, which at one time was said to add greatest amount of fly ash to the area's air, put in precipitators on its stacks at $340,000 cost; National Carbide is now installing dust-reducing equipment at its plant; Kosmos Cement Co. is installing dust-collecting equipment.

The oil companies in the area were given five years to comply with the regulations (other companies, one year), and are still testing possible equipment.

in pollution abatement, after starting from way behind its own goal posts. It continues to pour an estimated $300-500 million/year into pollution control. Few new CPI plants are built today without considerable money and energy being spent on waste disposal. Industry-sponsored research studies flourish. Chemical companies are perfecting their antipollution devices and techniques.

Still, the air-pollution problem grows more critical every year. The water-pollution problem, although reduced on 21,000 miles of interstate streams, "is growing worse rather than better," according to Gordon McCallum, chief of the Health Service's Division of Water Pollution Control.

The economic aspects of the problem are serious. Problems caused by air pollution are estimated to cost on the order of $5 billion/year, roughly 1% of the gross national product. To combat water pollution, current expenditures for industry alone are an estimated $1.9 billion, with $10.2 billion more needed by '80.

Where CPI Stands: In many cases, the chemical companies in high pollution areas are caught in an unfortunate middle position: shouldering the financial burden of keeping their own houses clean and paying added taxes to fight the pollution of others; spending substantial amounts for antipollution research and bearing the brunt of local scorn.

The inherent public relations problem in these situations goes beyond just being in the good graces of the local citizenry. In perhaps no other area can small private, public and industrial groups militate as effectively against industry. Fortunately, the CPI efforts are recognized in many cases by the local pollution-control authority, which has a single-minded and disinterested view of intra-area squabbles coupled with the facts and knowledge of the situation.

Evolution of Regulation: From the oyster growers of the Pacific Northwest to the citrus growers of Florida, and from the yacht clubs of Long Island Sound across to the recreation committees of California, the small groups have demanded action. Often, the groups that have grown up around an industry complain most loudly about that industry.

In the usual progression, these groups gain strength and eventually municipal support. The next step: official "studies" of the situation. These can be made by the companies or industry involved, state or local pollution authorities, the federal government, or all three. Sometimes, antipollution efforts do not get beyond the point of studies and recommendations.

For example, in the tricounty area that holds Florida's superphosphate plants, the tactics of the Florida Air Pollution Control Commission and the Bureau of Sanitary Engineering (both reporting to the Florida Board of Health) have been, in the words of a leading Florida state sanitary engineer, "conference, conciliation and persuasion." Severe criticism of companies is then counterbalanced by excessive praise for only average efforts to combat pollution.

More often, the various studies and recommendations have resulted in state legislation that allows local regulation. When laws encompass the whole problem, they are not usually unfair to CPI firms, just expensive.

Pollution Legislation: As a result of many local, regional and statewide studies, hasty action and a lack of coordination, the network of antipollution regulations and laws that exists is tangled and complex.

Over 80% of all present municipal air-pollution abatement ordinances, for example, have been enacted in the last 15 years, following the rapid postwar industrial growth. Much of the control legislation was rushed through, and—according to legal experts—was based on existing pollution laws that were antiquated and poorly justified.

Federal observers offer hope that an unsnarling of the laws is possible. Creation of the new Division of Air Pollution in USPHS last September promises better coordination with state and local air-pollution control units. The formation of more statewide air-pollution control districts also offers a chance at some codification of conflicting local ordinances.

Where statewide laws exist, the more recent statutes follow one or more of three general approaches: (1) a broad enabling act authorizing the establishment of control districts; (2) a research and technical assistance program; (3) and an air-pollution control program concerned with the prevention and abatement of pollution

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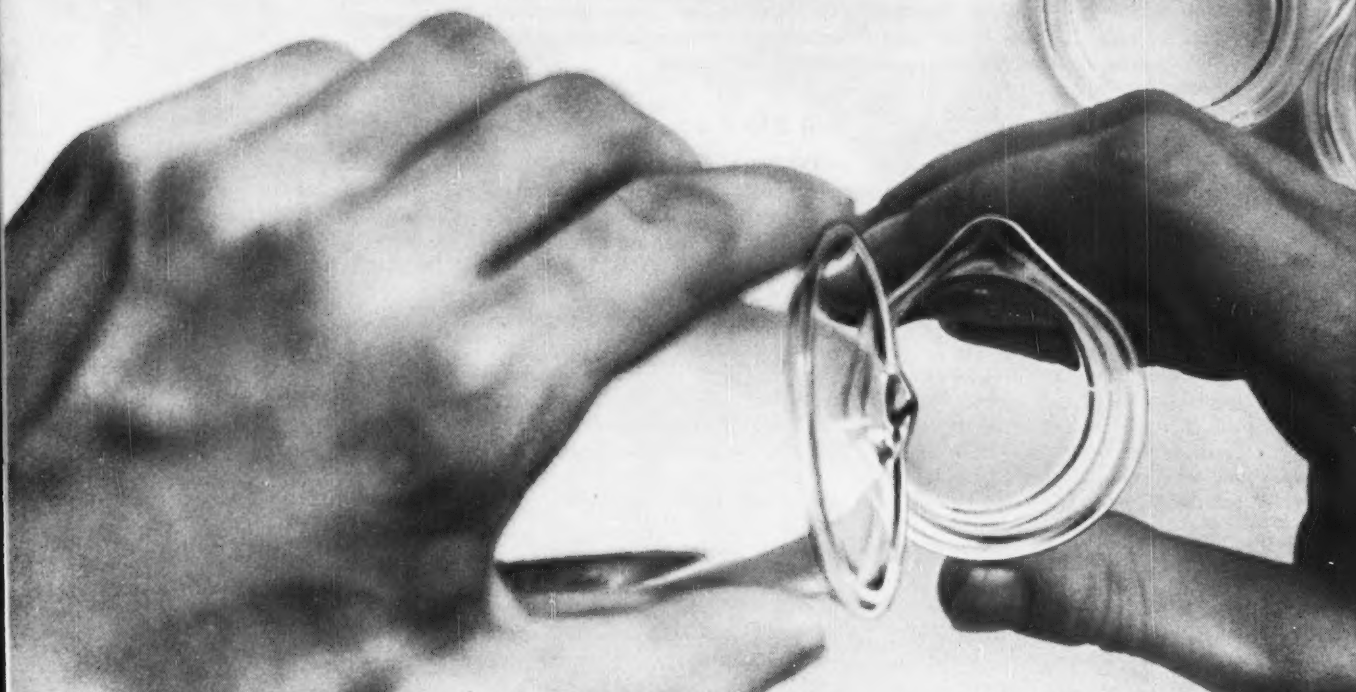

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problems in all areas of the state. However, only 13 states now have these inclusive laws: Oregon, Massachusetts, New Jersey, California, Nevada, Colorado, Delaware, Florida, Minnesota, New York, Ohio, Washington and Hawaii.

In water-pollution control, the fights these days are not so much over which laws apply and what they mean, as they are jurisdictional disputes between federal and local authorities. This situation seems likely to continue. New water-pollution control legislation is high on the agenda for the next Congress.

Enforcing the Laws: Throughout the country—and even at the federal level—there is one noticeable feature of both water- and air-pollution laws: the enforcing agency is generally kept on the "local" level so far as this is possible. (There appear to be contradictions: the federal intervention in Southern oil fields regarding brine disposal and the current precedent-setting federal court case against St. Joseph, Mo., where the government is attempting to force the city to build a new sewage treatment plant).

The philosophy of local-level administration and enforcement of antipollution activities—endorsed by the Manufacturing Chemists' Assn. and other industry representatives—was recently put into effect in California, where the Bay Area Pollution Control District decided to leave enforcement to the cities and counties within the district (*CW, Nov. 26, p. 74*). It is only in this way that pollution-control authorities can minimize inequalities and prevent unnecessarily restrictive regulations.

Outlook for CPI: Without a doubt, situations that exist in the CPI now will continue, may become more troublesome. Air and water pollution will increase, and industry will keep on spending vast amounts for research and development of techniques to combat the problems.

Best guesses are that federal control will slacken as more states are prepared to undertake pollution prevention and abatement. The new Administration, however, will likely offer greater federal aid, testing and research facilities, and also ultimata to problem centers. And this combination effort will likely spell an increasingly stringent regulation for the CPI to observe.

Potash on Probation

American Potash & Chemical Corp. (Los Angeles) has been put on probation by the U.S. Dept. of Commerce for one year for alleged violation of government export regulations.

AP&C was charged with shipping 1,000 tons of boron products to Yugoslavia in '57-'58, and it's claimed that a substantial portion of those products was then transhipped behind the Iron Curtain without U.S. approval, in violation of federal law, which requires that shipments headed for the Soviet Union and satellite countries from U. S. companies must receive Commerce Dept. approval in most cases.

Prior to American Potash's probation, export privileges of two former officals had been suspended. They are Edward Kolb, former general sales manager of the Heavy Chemical Division, and Ernest Graupner, former manager of the Export Division.They were denied export privileges for eight months and one year, respectively. American Potash, according to the Commerce Dept., was not denied its export privileges because it cooperated fully in investigating the violation and because the officers disregarded announced company policies with respect to the exports.

LABOR

Oil Bargaining: First indications of oil industry wage bargaining patterns are beginning to show up. An offer of a 5% wage increase to employees of American Oil Co.'s Texas City, Tex., plant (*CW, Dec. 3, p. 70*) has been followed by offers of 5% by other companies. At Whiting, Ind., Standard Oil Co. of Indiana management has offered the Independent Petroleum Workers of America Local 1 a 5% wage increase, same as an earlier offer to the Oil Chemical & Atomic Workers Union. And Mobil Oil Co.'s Midland, Tex., Division has offered a 5% hike to production employees represented by another independent, Associated Petroleum Employees Union. Most of the offers include a two-year contract, and would amount to about 14¢/hour for many employees. While these offers by and large affect only salaried or independently represented employees, they nevertheless are well above the minimal increases the industry claimed it would offer earlier in the year.

•

Chemical Row: Along Petrochemical Row near Orange, Tex., another round of pay hikes is going into effect. Increases of 7¢ to 11¢/hour have been granted to employees along the row who work for Du Pont's Sabine River Works, Firestone Tire & Rubber Co. and Spencer Chemical Co. A similar increase of 3% — about 9½¢/hour—has become effective at Allied Chemical's plant there. Last flurry of pay hikes along Petrochemical Row was in June '59.

KEY CHANGES

Charles E. Braun to vice-president and manager, Southeastern Division, Puritan Chemical Co. (Atlanta).

C. David Haacke to president, **Henry G. Gruber** to vice-president, **George London** to treasurer, **H. P. Tatelbaum,** to secretary, **Mary L. Brice** to assistant secretary, Lehigh Chemical Co. (Chestertown, Md.).

Dr. F. Douglas Lawrason to executive medical director, Merck & Co. (Rahway, N.J.).

Clark P. Lattin, Jr., to vice-president, Petroleum and Petrochemical Development, Chemical Construction Corp. (New York).

Harry B. Paul to manager of European operations, International Division, Atlas Powder Co. (Wilmington, Del.).

Gilman S. Hooper to director of research and development, Fiber Development Dept., Hercules Powder Co. (Wilmington, Del.).

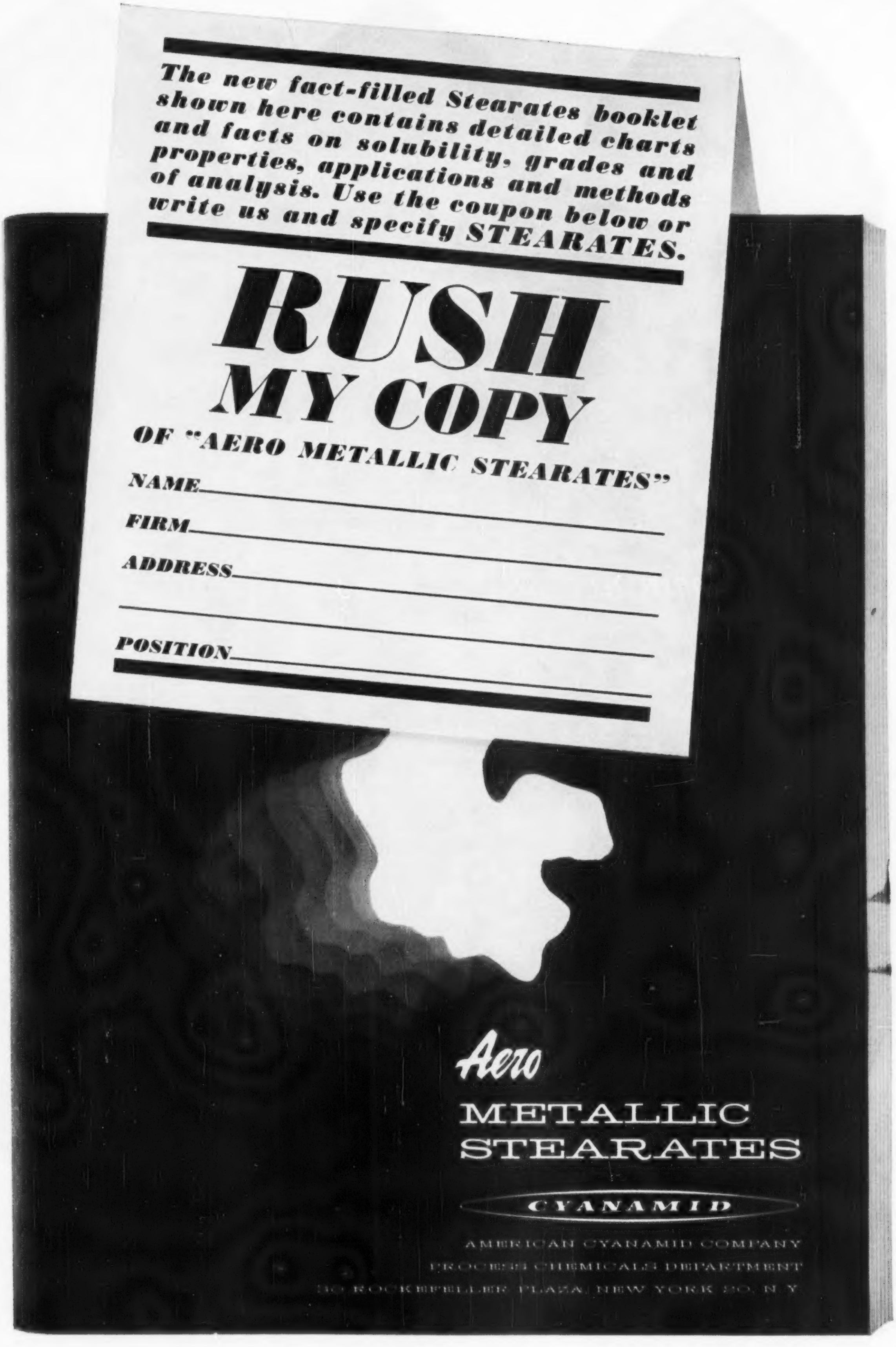
Gerald Kirshbaum to vice-president, The National Distillers Products Co. (New York).

RETIRED

Gordon H. Chambers, chairman, Foote Mineral Co. (Philadelphia).

DIED

Franklin Farley, 66, former president, Chlor-Alkali Division, Food Machinery and Chemical Corp., at Lakeland, Fla.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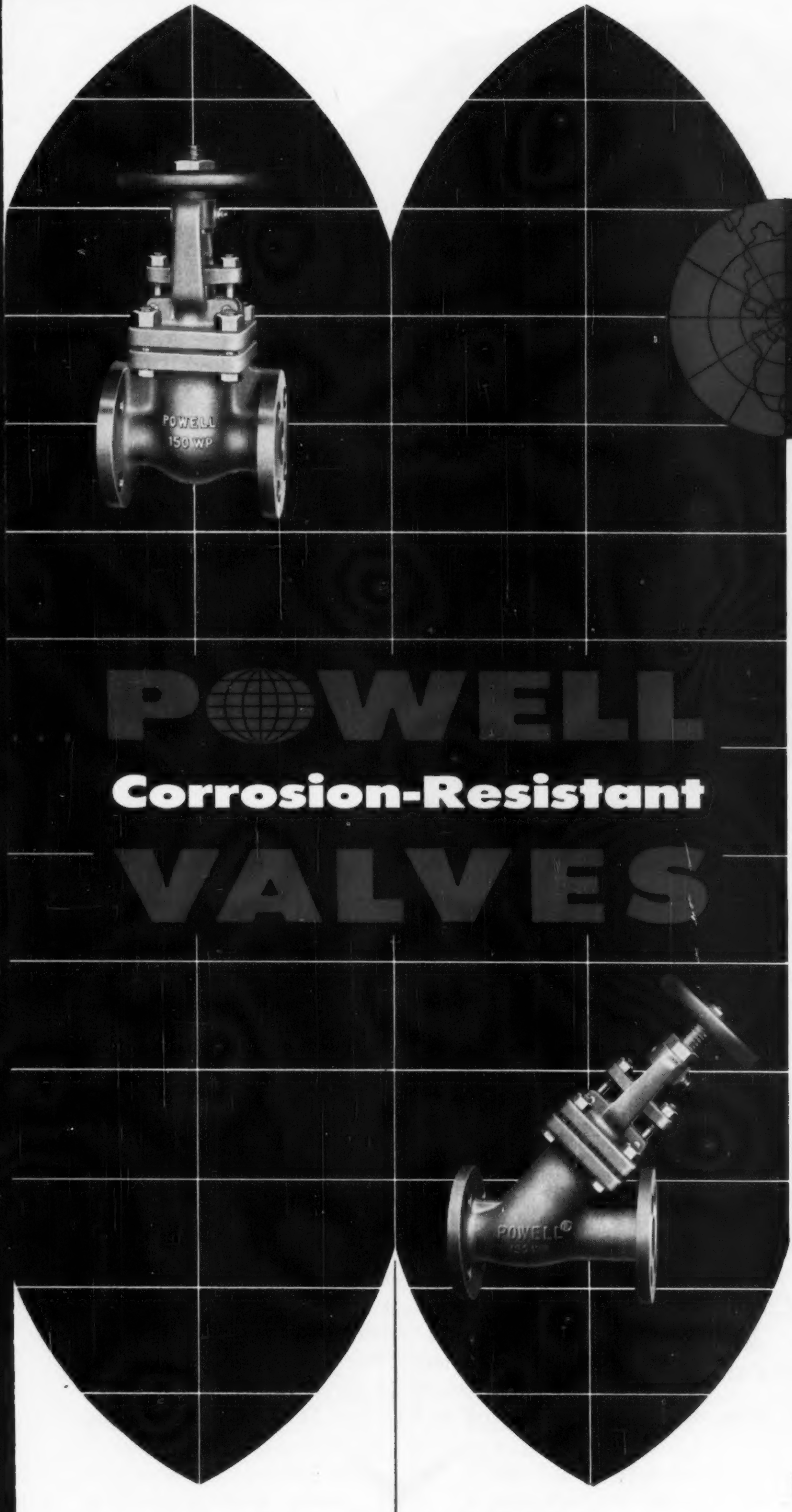

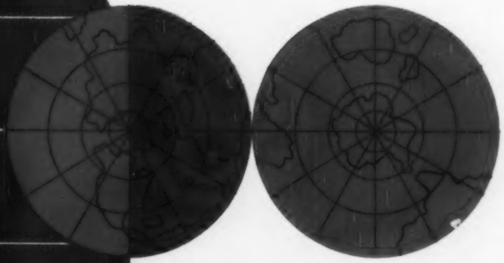

Fig. 2491—Stainless Steel Gate Valve for 150 pounds at 500F. Bolted flanged bonnet. Outside screw rising stem and yoke. Fully guided solid or split wedge discs.

Fig. 2107—Stainless Steel "Y" Valve for 150 pounds W.P. at 500F. Bolted flanged bonnet. Outside screw rising stem and yoke. Also available with screwed or socket welding ends.

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Rogers' Greenman (right) outlines company's goals to department managers Spiwak, Brooks, Berry.

Branching Out with Fibers and Polymers

Antennae windows for missile nose cones, molded printed circuits, jet-engine heat shields, electrical insulation, liquid-level floats, and shoe insoles don't appear to have much in common. To Rogers Corp. (Rogers, Conn.), however, they have this in common: they are all products of the company's strenuous effort to diversify, and they've been made possible by the company's quick capitalization on new chemical raw materials.

Rogers came out of World War II almost completely dependent upon the electrical field, for which it is the country's top insulation board supplier. By parlaying its long (128 years) experience in papermaking techniques with a stepped-up research program, the company now uses fiber-polymer know-how to serve other fields besides the electrical industry. In fact less than 20% of its total sales dollar ($7.3 million) is now derived from electrical insulation board—and that share is still shrinking.

Basically what the company has done is to aggressively search out areas that use materials (either as raw materials or fabricated goods) made by combining fibers and polymers. Or, as the company enthusiastically puts it, it has become "creator and converter of Fiberloys, nonmetallic alloys made by combining fibers and chemicals for use where conventional materials do not meet the demands of modern technology."

A specific example of how the company has combined fibers and polymers is the reinforced-Teflon antennae window (for the Atlas and other missiles), which stands up under the heat of ablation but is transparent to electrical signals. Another use of fiber-polymers is the molded multilayer circuits used in the modular system computers. Another: piston rings that operate at temperatures up to 600 F. One of the company's materials is the heart of a precision ball bearing capable of operating without lubrication up to around 575 F.

Who Makes What: Rogers is both a supplier of raw materials used by others and a converter of these same materials into finished products. There are four divisions in the company: the two raw-material suppliers, Manchester and Rogers, and the two converters, Killingly and Willimantic divisions.

Rogers and Killingly are both in Rogers, Conn., in a textile plant that Rogers bought from Goodyear in '35 when that company moved its textile operation south. Rogers supplies raw materials, of fiber-elastomer or fiber-plastics combinations (called Duroids), which are used in gaskets and electrical insulation. There are about 20 of these combinations at present. Rogers also makes another raw material, Poron, which is a microporous vinyl chloride, described by Rogers as a "breathable" plastic.

The company started producing the material in Aug. '60, having bought the rights to it from United Shoe Machinery Corp. Although the original material is a replacement for leather insoles, others may prove useful in other fields as well. Some possibilities for end-uses are surgical face masks, golf club grip wrapping, upholstery, and battery separators. The material is also being used, after compression, as a printing plate material.

Rogers has some other "breathable" plastics in mind, too; it's working on

microporous polyethylene, polypropylene and Teflon.

Killingly Division, set up in '44, makes finished products such as nose cone antenna "windows," molded circuits, heat shields and piston rings.

Manchester Division (Manchester, Conn.) makes plastic molding materials both in sheet and nodular form. Besides phenolic resin and fiber molding materials, which the company has made for some time, the Manchester Division this year began production of molding compounds made from Food Machinery and Chemical's diallyl phthalate.

Willimantic Division (Willimantic, Conn.), bought by the company in '56, makes molded rubber products such as carburetor floats and control diaphragms. In '56 the company was supplying 80% of the special rubber filler used in aircraft propellers, but the Air Force discontinued that project not long afterward.

The company is the leading supplier of nitrile ebonite rubber floats and is now making parts molded from reinforced Viton materials.

Move Either Way: By having both converting operations and raw-material processing facilities, the company is now able to develop materials with special properties for captive or outside use; or it can use its own raw materials to develop new finished products. For example, its shoe industry customers provide stability; the electronics customers hold the tempting growth prospects.

The Pudding: It all adds up to a company that has grown solidly, stands a good chance of much more growth. Sales in '54 were $4.9 million (earnings $82,200). Sales this year are $7.3 million (earnings $300,000), and the outlook for '61 is $9-million sales, with "substantially higher" earnings.

Making this optimistic estimate is Norman Greenman, vice-president, marketing, a 37-year-old Massachusetts Institute of Technology graduate who joined the company in '48. Much of the company's recent success is credited to the influence of his marketing plans and diversification steps.

Beyond '61, Greenman is making no predictions. But it is clear that Rogers Corp. will continue to use new polymers as quickly as the chemical industry can turn them out—and it will welcome any diversification they may bring.

For Outdoor Vinyls

Vinyl films have their place in the sun—that is, until fungi, heat and light get to them. But now the films may find extended use in outdoor applications such as pond liners, building covers, and agricultural films. A new epoxy plasticizer-stabilizer claims to eliminate some of the above drawbacks.

The new product, di(iso-decyl)4,5-epoxy tetrahydrophthalate, was developed by Union Carbide Chemicals Co., is hailed by that company as the only epoxy compound that combines the compatibility and plasticizing effectiveness of primary plasticizers with the heat and light stabilization of epoxy stabilizers. Unlike other plasticizer systems (epoxidized soybean oil and alkyl epoxy tallates), which are attacked by fungi, the new system reportedly will not support fungi.

Carbide calls its new plasticizer Flexol PEP (primary epoxy plasticizer), is pricing it at 40¢/lb. in bulk. That's a hefty 12-13¢/lb. over the cost of epoxized soybean oil stabilizers. But initial field tests of the product (under the designation Flexol 163-D) have apparently convinced the company that vinyl film makers will pay a premium for the added properties.

Flexol PEP has a molecular weight of 466.7, a viscosity of 184 centipoises at 20 C. It's used at a concentration of 5 to 15 parts per 100 parts resin when employed strictly as an epoxy-type heat and light stabilizer; at concentrations of around 70 parts per 100 parts resins when used as a dual plasticizer-stabilizer.

Not Alone: Commercialization of Flexol PEP gives Carbide four entries in the 35-million-lbs./year vinyl plasticizer business (about 18 companies compete in this field). Late last year the firm brought out two epoxidized soybean oils, Flexol EPO and Flexol JPO. In March of this year it unveiled Flexol EP-8, an epoxy ester-type plasticizer.

Besides putting Carbide deeper into the vinyl plasticizer field, the new product provides the firm with another outlet for derivatives of its peracetic operations at Institute, W. Va. (*CW, July 2, p. 59*).

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sistance in vinyl film. But the high cost or tricky processing required ruled it out as having possibilities of commercial success.

Now, with a single plasticizer system that can act as both stabilizer and plasticizer, Carbide thinks it has a winning combination—high price notwithstanding. It's confident that by helping to move vinyl outdoors, it will help itself to sell more plasticizer.

PRODUCTS

Textile Softener: Sonneborn Chemical and Refining Corp. (300 Park Ave. South, New York 10, N.Y.) has a new textile softener, Sonofin 3639A, said to be compatible with a variety of finishing agents. For use in textile wet processing, it is a nonionic, white liquid that can be used with resins, catalysts, dye fixatives and dyes. Sonneborn says the softener is particularly suited as a lubricant for spun knitting yarns because of its antistatic properties.

•

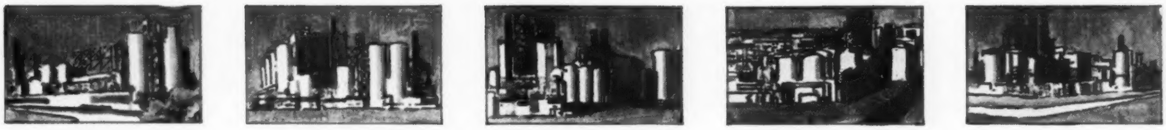
Epoxy Coating: Columbia Technical Corp. (24-30 Brooklyn-Queens Expressway West, Woodside 77, N.Y.) is now selling a 100% solids, single-component epoxy coating for continuous operation up to 155 C. Humiseal 1F56, a high-temperature rigid epoxy system, may be used directly from the container and applied by dip or brush. Heavy coatings are obtainable.

•

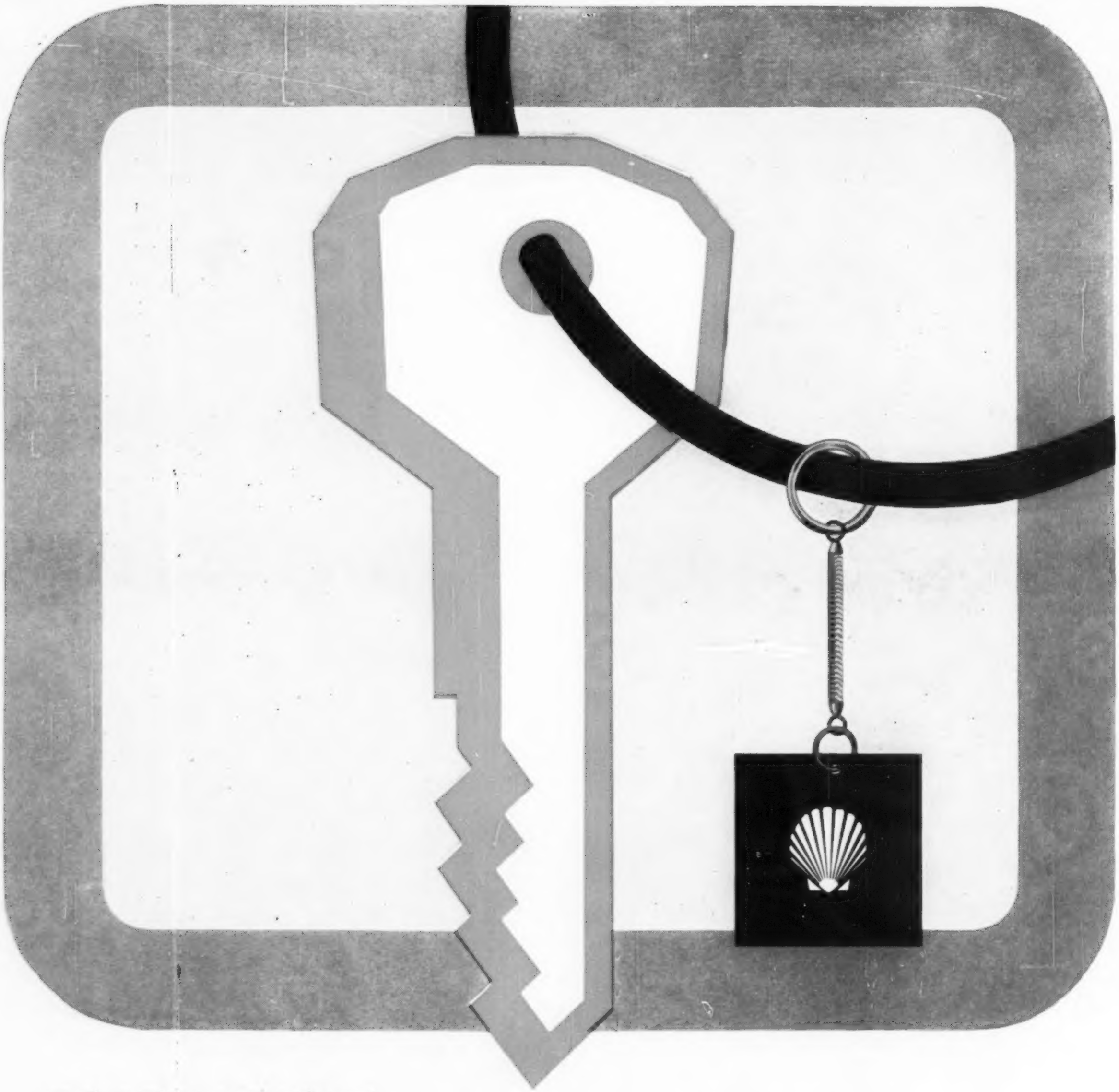
Decal Base: Permacel (New Brunswick, N.J.) has developed Decalar 956, a decal base material of 3-mil metalized Mylar said to be highly impervious to oil, solvents, detergents, water, acids, and all alkaline solutions. It can be die-cut and silk-screened, will adhere to any metal, wood, glass, leather or plastic surface. Low initial tack, due to its new adhesive, permits repositioning of the decal without loss of ultimate bond strength.

•

Epoxy Plasticizer: Wilson-Martin Division, Wilson & Co., Inc. (Snyder Ave. & Swanson St., Philadelphia), has added two new epoxy products to its line of plasticizers. Wilmar 51, a butyl epoxy stearate, and Wilmar 53, octyl epoxy stearate, are suggested for primary plasticizers and vinyl stabilizers.




COMPLETION
REPORT



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SHELL

Washington
Newsletter

CHEMICAL WEEK
December 10, 1960

Gov. Abraham Ribicoff will support a stronger federal role in Health, Education & Welfare programs as the new Secretary (*see also p. 26*). He is what colleagues describe as a "level-headed liberal." He talks in fairly conservative terms, but his experience as governor of Connecticut impressed him with the limits on what a state can do without federal help.

As governor he strengthened welfare programs, but only to a limited degree. He is strong for federal aid to education on the grounds that financial resources available to the federal government are more substantial and more equitable than those available to states. The same philosophy would prevail in water-pollution problems and other HEW programs.

Ribicoff had long been rumored for the Attorney General job, but associates say he really preferred HEW. He wants a U.S. Supreme Court appointment eventually, and the civil rights battles confronting the next Attorney General might prejudice his confirmation by the Senate for the Supreme Court. Putting Ribicoff at HEW, therefore, does not necessarily mean the Attorney General's job is being saved for Robert Kennedy. Such an appointment would cause great controversy, and the President-elect knows it.

•

FDA Commissioner George P. Larrick may be eased out by the Kennedy Administration. Kennedy and Ribicoff both respect the civil service system, and Larrick's job is a civil service post. But there is pressure from the Senate, particularly from those who support Senator Kefauver's drug price investigation, to persuade Larrick to resign.

They feel his administration of FDA lacks vigor, citing such things as his apparent lack of knowledge of what was going on in the antibiotics division under Dr. Henry Welch. Welch resigned after revelation of his substantial outside earnings.

But Larrick may decide to make a fight of it if they try to oust him, in defense of the career principle for the Food & Drug Administration. He has influential friends in Washington who could aid him in such a battle. Larrick is 59 years old, has more than 37 years' service at FDA and has been commissioner since '54.

Surgeon General Leroy Burney is subject to some of the same kind of pressure. His four-year term expires June 30, '61; and since his appointment was political, there would be no hesitancy about replacing him in the Kennedy Administration.

•

The Treasury Dept.'s depreciation survey reveals widespread dissatisfaction with present depreciation rules and a desire for methods that would give the taxpayers more flexibility.

Questionnaires were sent out to thousands of companies last July.

So far, replies have been received from about 80% of the larger firms but from a much lower percentage of smaller companies contacted by the Small Business Administration.

A preliminary report will be issued by the end of this month, with the final findings slated to be released early next year.

•

Results of a practically identical survey using the same questionnaire have been released by the Tax Research Institute (New York), a private organization. It sent the survey to 30,000 members. Here is a summary of replies received to date:

• 41% think present depreciation allowances are satisfactory, 50% do not.

• 47% say liberalized depreciation allowances would influence them to increase capital expenditures.

• Chief change wanted by 37% is freedom to choose their own depreciation methods and times—on a consistent basis.

• Second most important change, demanded by 23%, would adjust depreciation allowances to reflect increased prices.

• If depreciation allowances were liberalized, 79% would conform to specified accounting practices—and 58% would be willing to give up capital gains in disposing of depreciable property.

•

U.S. and Canadian industrial raw materials requirements, including commodities related to chemical processing industries, will double in the next 20 years. This is the prediction of a study by Office of Civil and Defense Mobilization staffer Wilbert G. Fritz for the National Planning Assn. and the Private Planning Assn. of Canada.

The report says that the U.S. will be increasingly dependent on Canada for iron ore, natural gas, nickel, asbestos, petroleum products, wood and pulp, cobalt, copper, lead, zinc and sulfur.

Canada will be buying more U.S. coal, molybdenum and phosphate. Both countries will be short of bauxite, chromite, fluorspar, manganese, tin and tungsten.

•

A fee schedule for pharmacological testing of color additives will be proposed by the Food & Drug Administration. Franklin D. Clark, assistant to the deputy FDA commissioner, says the schedule has not yet been worked out. Even when it is, he adds, such testing will be available only within FDA's laboratories.

Clark also predicts a continuation of present fee schedules for certification of color additives by FDA and establishment of a variable fee system to cover the cost of permanent listing of such additives. Both would be on a cost basis, the latter depending on the extent of the listing requested.

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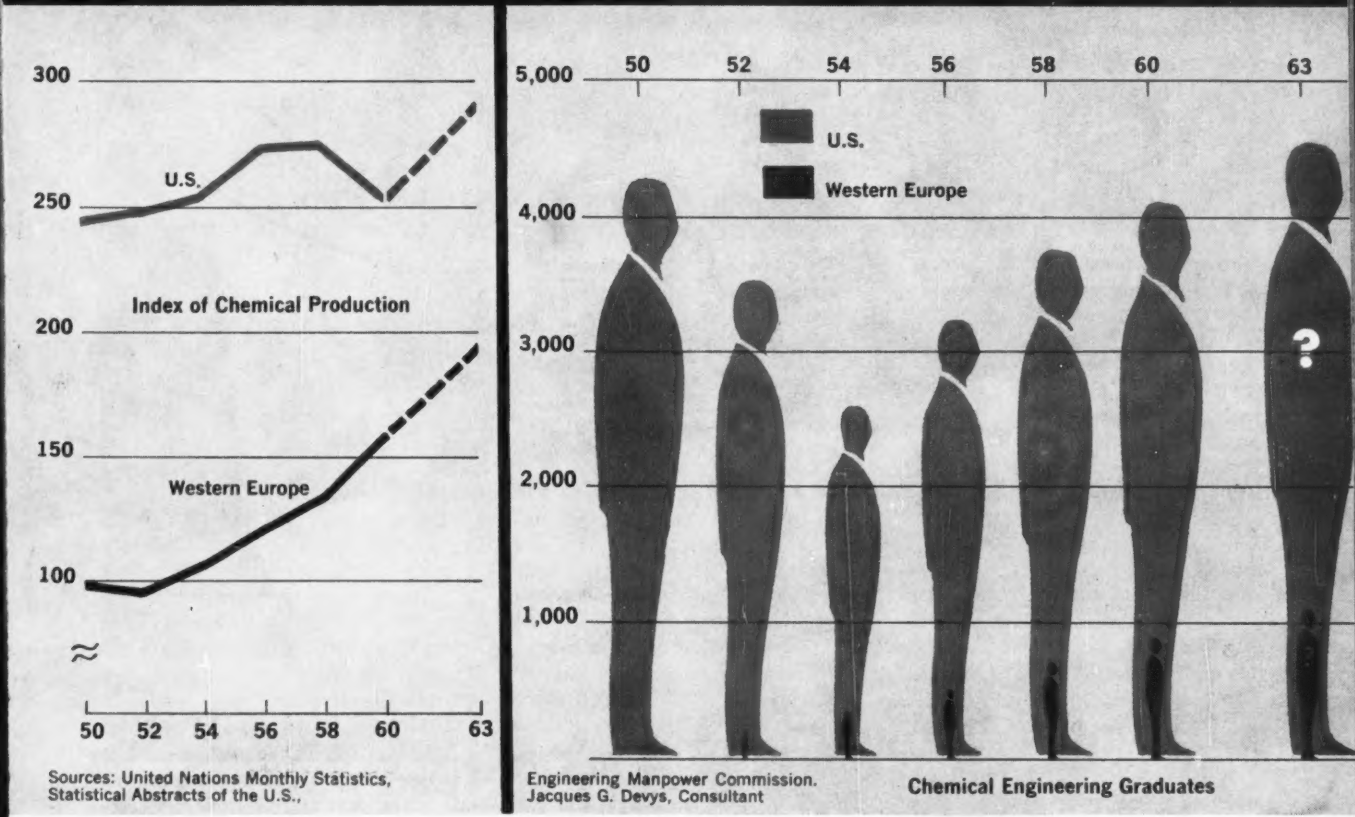
Chemicals Boom In Europe . . . But the Output of Chemical Engineers Is Lagging.



European Engineering: Your Problem Now

U.S. firms investing in Europe would do well to study the chart above. It shows that while Europe has half as much chemical production as the U.S., it graduates only about one-fifth as many chemical engineers. What's more, Europe's engineer output rate still lags, although its process industries are growing faster than ours.

This shortage of chemical engineers is not only disturbing to European producers but also a problem to the U.S. chemical industries. U.S. firms are participating in the construction of 27 chemical plants in Western Europe. U.S. capital investment in European chemical plants amounted to about $81 million in '59; planned spending this year and next amounts to $131 million and $151 million, respectively.

This accelerated growth is easily explained: the market is bustling (during the last five years European chemical production has jumped 68% vs. 38% in the U.S.) and U.S. firms that want to compete effectively in Europe must build plants there.

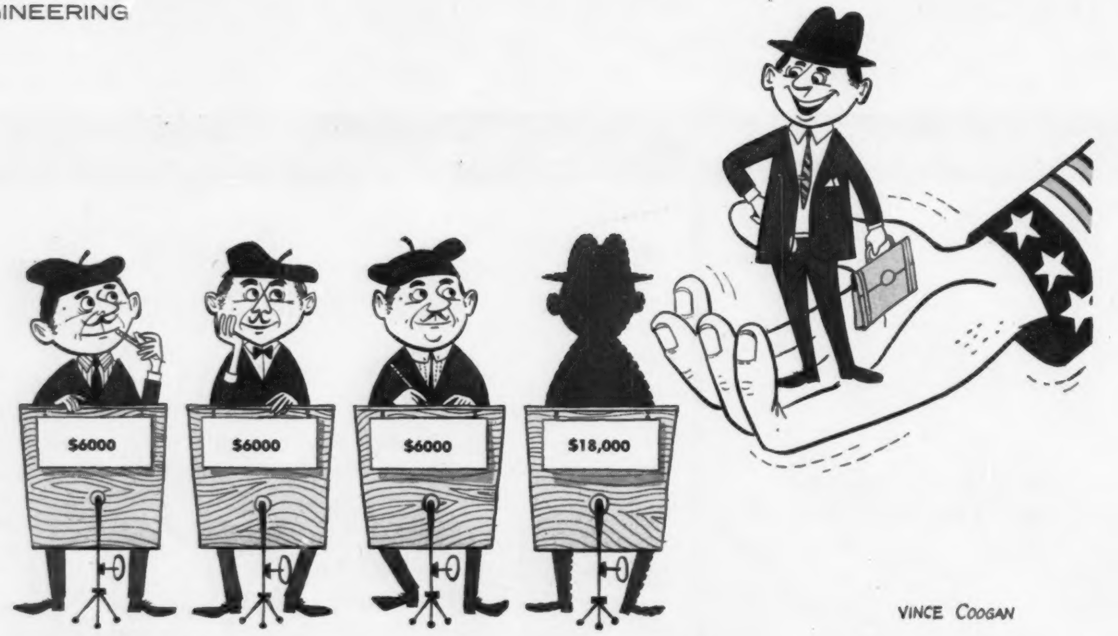
Potential of the European market stems from a relatively large population—there are 144 Europeans for every 100 Americans—plus a solid base for industrial expansion. According to Jacques G. Devys, consulting engineer (New York and Paris), electric power output in '59 was 57% of the U.S. value; gross national product, 62%; automobile output, 73%; and steel manufacture, 79%. Coal production was ahead of the U.S. in value by 21%; and Western Europe's exports were 245% the value of U.S. exports.

Moreover, Europe exerts strong investment appeal to U.S. firms. Now that American systems for standardization and subdivision of work tasks have become fashionable, plants cost 80-90% of what they cost in the U.S.

Dearth of Men: American investment abroad only aggravates the shortage of chemical engineers there and forces U.S. firms to supplement affiliated foreign engineering staffs with Americans—a costly practice.

An American chemical engineer's annual salary in the U.S. averages about $10,000. When sent overseas, a cost-of-living increment brings his salary up to about $18,000. In contrast, the European chemical engineer of comparable experience gets only $5,000-6,000/year, although his fringe benefits are slightly higher than here.

But the American chemical engineer earns at least a part of his higher



American engineer in Europe: Three times more expensive to maintain than a native.

cost. The American is a more practical engineer because he has plant experience, while the European has textbook experience. Thus Americans are sent overseas in supervisory capacities to direct the activities of European engineers.

And because they have actually seen different processes operate, American engineers are able to choose more easily between alternate designs. The European, on the other hand, is more adept at knifing through all the calculations necessary to work out detailed process specifications.

Recognition Reluctance: Reason for Europe's chemical engineer shortage is basic—Europeans are reluctant to recognize the chemical engineering profession. Even today, because German universities lean toward theoretical training in pure science, chemists are given only a few special courses to orient them for chemical engineering work. Result: few actual chemical engineers are graduated.

Instead West Germany, for example, turns out a *Verfahrens ingenieur,* which may be translated as process equipment engineer. In effect, he's a mechanical engineer who has taken process design courses. He teams up with a chemist to perform the work that a chemical engineer handles in America.

But, although Europeans may not recognize it, Europe has contributed mightily to the chemical engineering profession. It contributed processes for polyethylene, penicillin, synthetic ammonia and liquefied air. As for theoretical chemical engineering achievements, a Frenchman, Fourier, developed basic heat transfer theory, and his countryman, Sorel, is credited with the theory of continuous distillation. Also, an Englishman, George Davis, wrote the first "Chemical Engineering Handbook."

Other factors also figure into the slowness of chemical engineering's development in Europe. While two world wars accelerated growth of the chemical industry in the U.S., they took their toll of European industry and manpower. Also, management abroad is not inclined to tap the technical staffers for top corporate positions, thus decreasing the prestige of chemical engineers, which in turn has hindered the growth of professional societies.

The situation is different in Great Britain. Devys points out that in Great Britain, the Institute of Chemical Engineers (probably the only such European organization) grew from a membership of 185 in '23 to 5,300 in '59. This contrasts with the American Institute of Chemical Engineers, which has about 20,000 members, 40% of the U.S. chemical engineers.

Cures: Helping to stimulate the growth of professional societies is one way in which American firms can encourage the European chemical engineering profession.

But education is the area in which American stimulation can do most to reduce the European engineering shortage. Just as U.S. engineers carry production know-how to foreign countries, they might also foster chemical engineering education.

In some cases, this is already being done—to the benefit of both the European country and U.S. industry. Before it built in Holland* a petroleum company made certain that a local university would set up a course tailored to turn out engineers for its refinery. Now this course has expanded into a well-rounded program that educates chemical engineers for all phases of industry.

The Lummus Co. (New York) devised on-the-job training programs for French engineering students. These students as well as chemical engineering professors spend summers at the Paris office of Lummus. Before permanent assignment to either the Paris, London or The Hague offices, graduates are sent to the U.S. where they learn specific Lummus techniques.

By using foreign engineers when

* Which has two fine schools—Delft and Eindhoven—producing about 130 chemical engineers each year.

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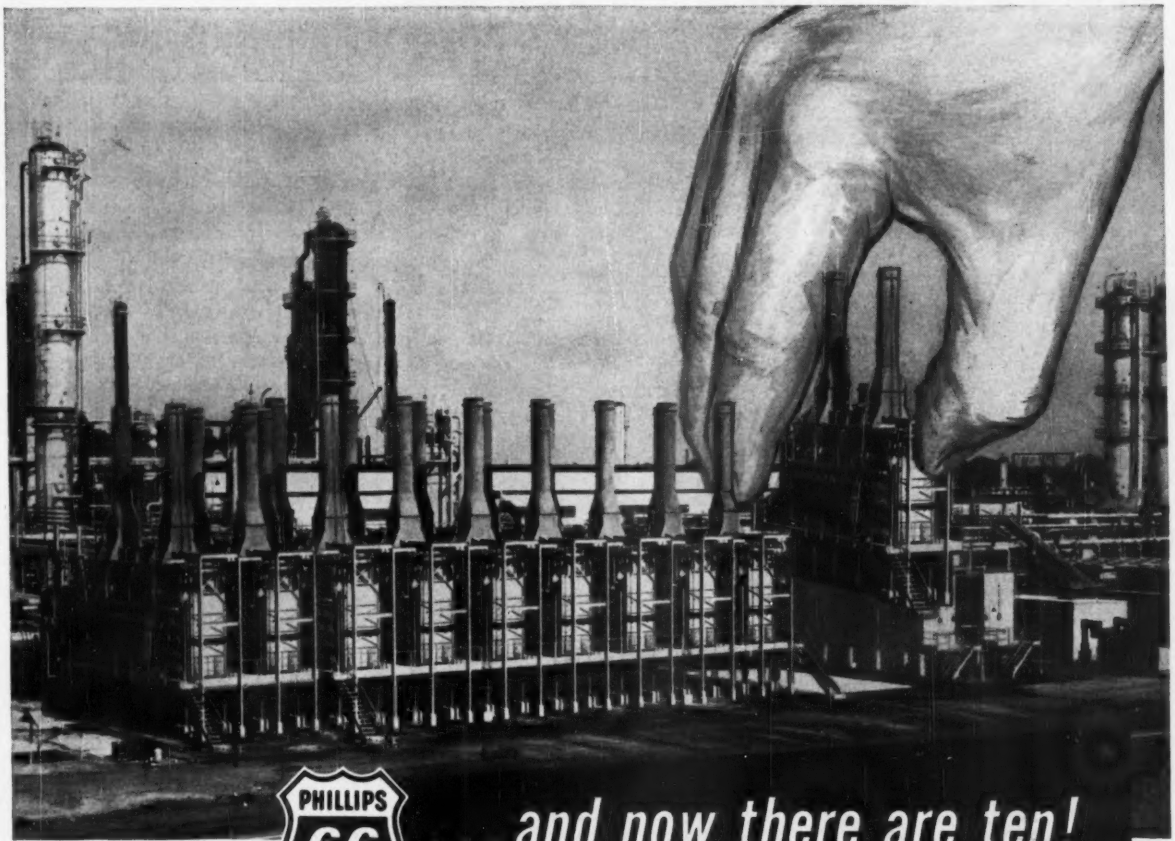

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possible, Lummus derives twofold benefits: (1) expenses for engineering salaries are reduced; (2) a source of well-trained men is always close by.

Europeans have great respect for chemists and scientists in general. This is another possible factor that American firms might well exploit when seeking to induce Europeans to take up chemical engineering.

Ours Overseas: In the forseeable future, at least, U.S. firms must continue to send Americans abroad.

Several characteristics are important in the selection of an engineer for a foreign assignment. Since he must win the respect and cooperation of European engineers, he must have technical prowess; most firms have found it wise to send their best men overseas.

An aptitude for languages is important. Even if he learned the language in college, he'll have to refresh his memory, adjust to the idioms and accent of the particular region in which he will work.

Last, but very important, an American family must be willing to integrate into a totally different atmosphere. Once overseas the engineer is expected to work at peak efficiency, unhampered by family problems. Many cases are on record in which this adjustment was too severe and the man was forced to return to the U.S.

At first blush, the qualities needed by an American engineer going abroad—technical prowess, language aptitude and family adaptability—might seem too demanding. But there are hundreds of Americans now working in Europe who measure up to these standards. These men not only do well for their employers but also foster the growth of the chemical engineering profession and are among America's best ambassadors to the non-Communist world. In addition, those Americans that learn to use their practical experience as a supplement to the very excellent theoretical background of the European engineers can justify their abnormally high overseas salaries.

In the final analysis, the American is costing his firm the equivalent of three European engineers. The long-range answer, of course, is more European engineers. It's basically a European problem, but one in which U.S. industry has a big stake.

Steel from Copper Slag

Last week Webb & Knapp and Strategic Materials Corp. showed off the process they will use in their planned $40-million plant for making low-carbon steel out of discarded slag. They made the 700-tons demonstration run at Strategic Materials' prototype plant at Niagara Falls, Ont.

Key to the copper slag-to-steel process is the standard Strategic-Udy process for separately dropping out the metallic components from various ores and slags (*CW, Aug. 13, p. 85*). In the particular version worked out for Webb & Knapp, each 5,500 lbs. of copper slag* (33% iron, 0.6% copper, 36% silicon, 2% zinc, etc.) is run through the kiln process along with limestone (4,700 lbs.), iron pyrites (440 lbs.) and coal (600 lbs.).

The fluid powders leaving the kiln drop to a "matting furnace," where copper is reduced and drawn off as molten product. Slag from the matting furnace passes to a semisteel furnace, where iron is reduced and drawn off as a 96%-pure product. And the 96% iron is finally smelted in a low-carbon steel furnace, which produces specification steels for rolling into billets. Zinc vapors from the matting furnace and semisteel furnace are recovered as zinc oxide by-product, while a cement-making slag is drawn off as by-product from the semisteel furnace.

Thus, for each ton of low-carbon steel produced, this process will turn out 25-30 lbs. of copper, 150 lbs. of zinc oxide; 5,000 lbs. of cement-making slag; and 150 lbs. of elemental sulfur as by-products.

The economics of the system appear very attractive. Webb & Knapp hasn't released the total investment and operating costs per ton of steel, but the firm has made comparisons. For example: copper slag can be brought to the kiln (to be built at Butte) at a cost of about 67¢/ton, compared with roughly $23/ton for iron ore. Electricity at Butte is 2 mils/kilowatt-hour; electricity will cost about $6/ton of finished steel. These costs, along with the relatively minor costs of limestone, iron pyrites and coal, are balanced against the value of a low-carbon steel product and by-products (zinc oxide, sulfur and

* From Anaconda Copper's slag heaps near Butte, Mont.

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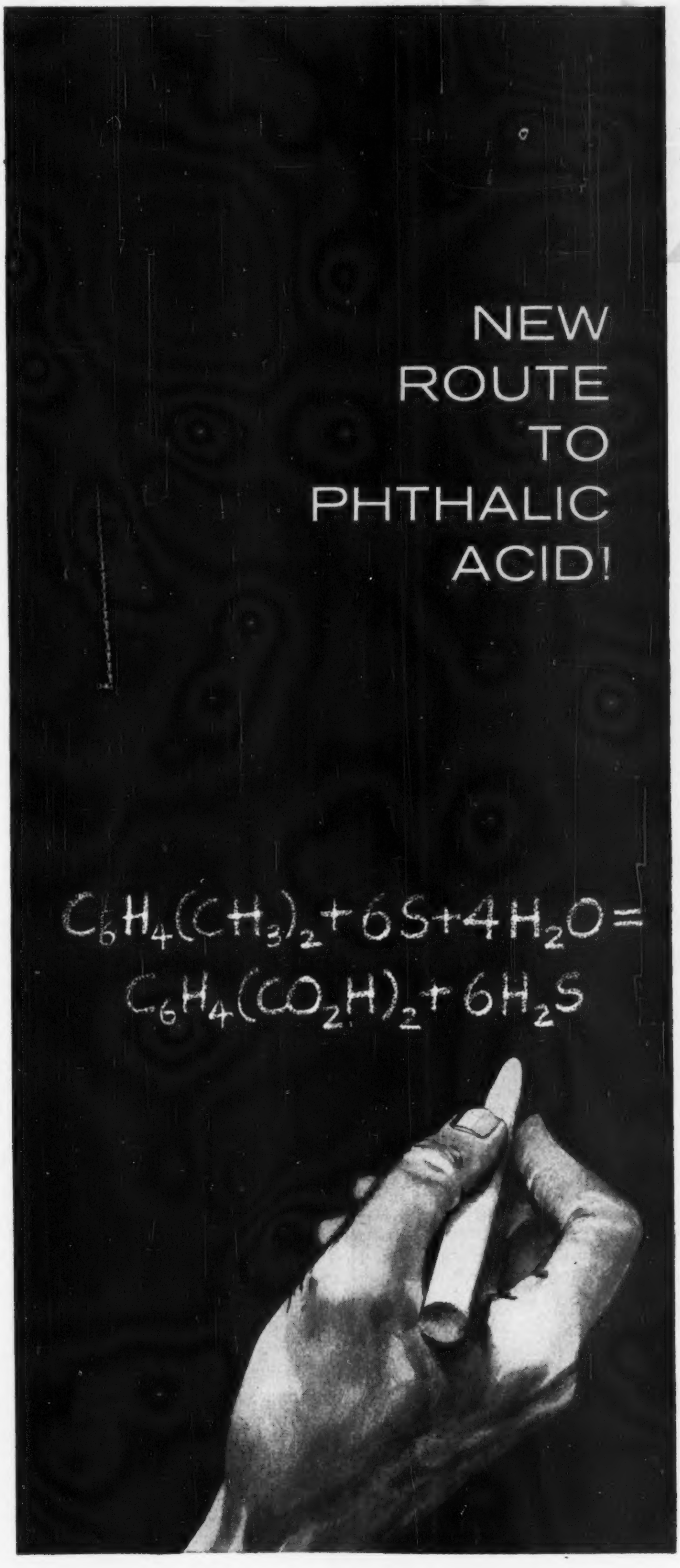

In a report to the Petroleum Division of the ACS, Dr. William G. Toland of the California Research Corporation recently announced the development of a new method for producing Phthalic Acid, with the following over-all reaction:

$$C_6H_4(CH_3)_2 + 6S + 4H_2O = C_6H_4(CO_2H)_2 + 6H_2S$$

Note that the presence of Sulphur right smack in the middle of this reaction is necessary for its completion. The Sulphur leaves the process at this point. The hydrogen sulphide can be oxidized to elemental Sulphur and returned to the initial reaction. It is thus operable in a closed cycle.

According to Dr. Toland, who developed this new route to phthalic acid, the process is simple and capable of high recoveries.

Here is another good example of how strongly Sulphur is in the processing picture. Together with its many derivatives it enters into countless reactions.

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cement-making slag) worth \$10 for each ton of steel produced.

The Butte plant will produce about 1,000 tons/day of steel from a slag reserve estimated at 40 million tons. To erect and operate the plant, Webb & Knapp has gone into a joint agreement with Strategic Materials (85% Webb & Knapp, 15% Strategic), and the firms may also undertake to reprocess the immense reserves of copper slag near other copper smelters scattered about the U.S. Estimates of the present world supply of this type of slag is 350-400 million tons, of which the U.S. has the majority.

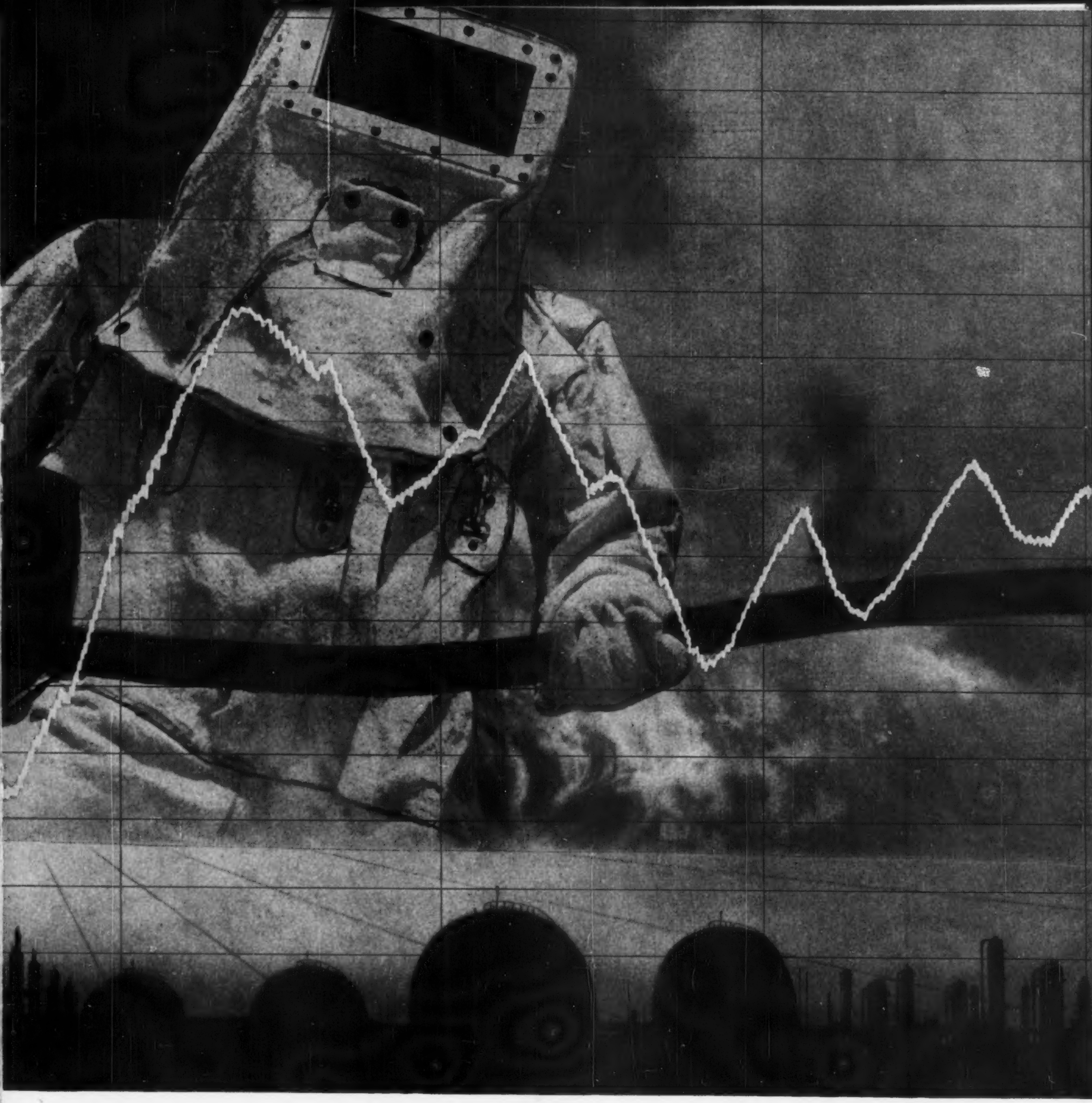
Although electricity costs near Southwestern copper smelters can run as high as \$18/ton for the process, Webb & Knapp expects to build more of the plants as soon as it gains operating experience at Butte. These plants will gain from the process's economical operation at capacities as low as 50,000 tons/year.

PROCESSES

Treating Process: A catalytic lube oil treating process that bypasses conventional acid and clay treating processes has been developed by British Petroleum scientists working at BP's development laboratory in Dunkirk, France, and at its Research Centre in Sunbury-on-Thames, England. The new process, called Ferrofining, takes medium-weight petroleum products direct from crude oil distillation and prepares them for a hydrotreating process making finished lube oils. Tests reportedly show that Ferrofined oils have superior oxidation resistance and blending properties, and BP is planning a 3,000-bbls./day Ferrofining unit for its Dunkirk refinery.

•

Epoxy Encapsulating: A new one-component epoxy encapsulating process for coating electrical components is claimed to speed output, cut waste and reduce the cost of encapsulation, according to the process developer, Smooth-On Manufacturing Co. (Jersey City, N.J.). In the new process, the epoxy is liquefied by heating at 325 F; it's then formed into a shell surrounding the part to be covered. The cure cycle is less than five minutes. This contrasts with the old system, which uses two components, requires measuring proper portions and then mixing.



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Italian drug shipment on New York pier symbolizes force behind producers' push for patents.

World Stakes Spur Italian Drug Patents

The U.S. government's recent purchases of low-priced antibiotics from Italy and its intention to buy more foreign-made drugs has done more than stir the wrath of U.S. drug producers. It has focused attention on Italy's unique situation: no pharmaceutical patents are issued in Italy, and local producers are free to copy any products developed by any other company, Italian or foreign.

But the U.S. producers are not the only ones charging "piracy." The major Italian drug companies themselves—doing perhaps half the country's drug business—are feeling the bite of copied products even more deeply than outsiders. Now they're pushing for legal protection that could relieve themselves and, incidentally, producers in the U.S.

A desire to win world markets, plus increasing competition from within the Common Market, is intensifying sentiment for revision. But industry feeling is far from unanimous.

For although the top four companies—Lepetit, Farmitalia, Carlo Erba and Squibb—carry on research aimed at the discovery and development of new materials, the majority of drugmakers there still rely for their bread and butter on copying drugs produced by other companies.

And the big producers don't find it easy to make a case that the situation is bad for the pharmaceutical industry.

Built largely after World War II, Italy's drug industry is one of the most modern in the world, and the fifth largest in the West, after those in the U.S., Germany, Great Britain and France. Some 1,000 Italian firms write up sales of about $300 million/year.

And foes of a patent law credit the wide-open situation with having helped this growth. Their case appears strong: unburdened by costly investments in research and development, Italian firms have been free to copy the best products of U.S., German and Swiss firms, undercut their prices,

Italy's 'Big Three' Drug Producers

	ESTIMATED SALES	*MAJOR PRODUCTS*
Ledoga-Lepetit	**\$60-65 million**	**Antibiotics, cortical hormones, tranquilizers.**
Farmitalia	**\$30 million**	**Broad range, from antibiotics to veterinary products.**
Carlo Erba	**\$30 million plus**	**Antibiotics, antidiabetics, gastric mucoproteins, etc.**

and still sell at considerable profit.

Moreover, the lack of a law hasn't discouraged foreign investment. Despite their firm adherence to the principles of patent protection at home, the world's largest pharmaceutical firms keep streaming into Italy, either setting up their own plants or tying up with Italian companies. Among them: Switzerland's Hoffmann- La Roche, Ciba, Sandoz and Geigy; West Germany's Hoechst, Bayer and Merck; France's Rhone Poulenc; and at least six U.S.-based firms: Olin Mathieson, American Cyanamid, Pfizer, Eli Lilly, Upjohn and Parke, Davis.

Two-Edged Sword: But proponents of patent protection maintain that satisfaction with this situation is shortsighted. The lack of patent protection discourages research, they say, and unless it develops its own new products the industry is bound to lag behind its international competitors.

For the smaller companies content to operate within the confines of the local market and uninhibited by international connections with firms that don't appreciate copying, this argument doesn't carry much weight. But the major producers, reaching out into world markets, find they have to lay out money for research, since they obviously can't offer copied products in patent-protected markets.

These big companies have already shown themselves able to turn up new products. Lepetit (Milan), the principal pharmaceutical producer in the Ledoga-Lepetit group, Italy's largest drug maker, spends over \$1.6 million/year on research out of its \$20-million sales. It has a staff of 350 researchers, including 150 working in pure research. It operates plants in Lisbon, Buenos Aires, Mexico City, São Paulo, Santiago de Chile and Sydney, and sells its products in over 100 countries. One of its recently discovered products: Rifomycin, which was presented at the Washington Antibiotics Symposium last year.

Farmitalia (51% Montecatini, 49% Rhone Poulenc), the second- or third-largest producer in Italy, also has big stakes in international sales. It produces ethical products in Brazil, Argentina, Venezuela, Germany, Belgium and Turkey, and distributes throughout the world. It invests about 6%—\$2 million—of its sales in research, has a staff of 495 concentrating on basic and applied research in antibiotics and anabolizing steroids.

Among the company's most recent discoveries are two antibiotics: Aminosidina (an oligosaccharide antibiotic) and Etruscomycin. It has also developed a new rumen microorganism that gives a good vitamin B_{12} yield in fermentation. And it has licensed Parke, Davis to employ its process for using light to transform chloramphenicol from the dextrorotatory to the levorotatory type.

In the last eight years Italian pharmaceutical producers submitted 2,500 patent applications all over the world, won 1,200 patents covering more than 120 new products.

What irritates the big producers, which account for the bulk of these discoveries, is that the multitude of small producers are riding free of charge. Only four companies rank in the 1,000-5,000-employees range, and only 128 have more than 500 employees. That leaves about 900 companies with staffs too small to conduct significant research. And, of course, some of the larger companies copy from each other, or from foreign firms.

Pulling the Rug: One major annoyance for the larger companies—and their foreign suppliers of raw materials or bulk products—are the techniques of some two-dozen "subdividers." These are small firms that specialize in copying raw materials and bulk products.

Their impact is intensified by the Italian government's system of price fixing. To fix the retail price of a drug, the government picks the lowest price at which its raw material is marketed, adds to it the packing and direct-labor costs. This result is multiplied by a fixed number, which has been 3 for firms that do no research, and 3.5 for firms active in research. This additional 0.5 amounts to a 10% increase in the wholesale price to cover research investments. But lately the government has been varying the research factor between 0.5 and 0.1.

The big firms naturally produce their own raw materials. Or they sometimes buy them from abroad, often from the companies under whose licenses they are producing the final products. Under these circumstances, the government price-fixing formula would yield a "good" retail price.

But what often happens is that a subdivider learns what the raw material is and offers it to the drug producer for a lower price than he can buy it from his foreign supplier, sometimes even lower than he can make it himself. (All drugs must be registered at the Ministero della Sanita, Italy's FDA. Although product descriptions filed are supposed to be confidential, it's no great trick for a producer to obtain one). Usually the quality is just as good.

The large company may still prefer to produce its own raw material or buy it from its foreign licensor. The government, however, bases the retail price of the finished product on the lowest available price of the raw material, so that the company often has no choice but to buy from the subdivider.

The problem is even more widespread with finished products. Once it comes up with a new product, a company must put it on the market fast and sell it hard. But promoting drugs is expensive in Italy, where there are 70,000 physicians, 10,000 drugstores and 1,700 hospitals. So Italian companies would rather forget about a prospective new product unless it looks like a pretty sure winner. If it is, the copiers move in after the original producer spends money developing the product and its market. This makes it difficult for the original producer even to recover his costs for some products.

The patent situation has helped

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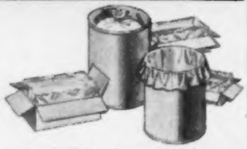


press down Italian drug prices to the lowest levels in the world. If, for example, the Italian antibiotic price is, say, 100, the relative price in the U.K. is 98; in France, 116; in Switzerland, 133; in Belgium, 163; and in West Germany, 274.

Common Market Squeeze: What may provide the sharpest spur toward winning patent legislation is increasing competition from Italy's Common Market neighbors, as Italy's tariff walls come down.

In June '59 the Common Market's pharmaceutical group suggested that member nations iron out legislative differences and come up with drug patent laws—product, process, or both—which would allow for liberal licensing and avoid monopolistic practices. It also recommended that pharmaceutical firms be free to set their own prices, in harmony with the liberal economic principles of the Common Market Treaty.

In Italy no step has been taken toward these goals. The result is that, while other Euromart companies operate in Italy, the Italian firms that have enjoyed copying privileges in their home market find it harder to enter other Common Market countries.

Opinions vary within the Italian industry on how the Common Market will affect it. Some producers are optimistic. They look forward to the broader market possibilities and the healthful effects of competition, and point out that companies based in the other Euromart countries already operate in Italy. Some optimists expect that raw-material prices will be forced down and that Italian producers will have a competitive edge in ethical products because of their high degree of specialization in this sector of the industry, which resulted from the patent situation.

But other companies are worried about the competition from better-organized, patent-protected companies.

Optimistic or pessimistic about their competitive chances, the major firms are all convinced that the lack of patent protection has resulted in a relative trickle of original products. They say it will take original products to compete with maximum effectiveness against foreign producers, on the home market or on foreign soil.

Patents Pending? The patent issue seems to be coming to a head—slowly. Two years ago it was at the core of an industry schism that ended in major producers Lepetit, Farmitalia, Carlo Erba and Squibb splitting off from Italy's principal industry association, Unione Nazionale Industrie Farmaceutiche (UNIF), and forming their own, Pharmindustria.

Pharmindustria is pushing for a law protecting both processes and products. UNIF, composed essentially of middle-size firms, wants only a process patent law—its members are more active in product development than in basic research.

Right now there are two drug patent bills in the Parliament. Neither is designed to make the major producers happy. One, drawn up by Parliament member Luigi Bima, would limit protection to processes.

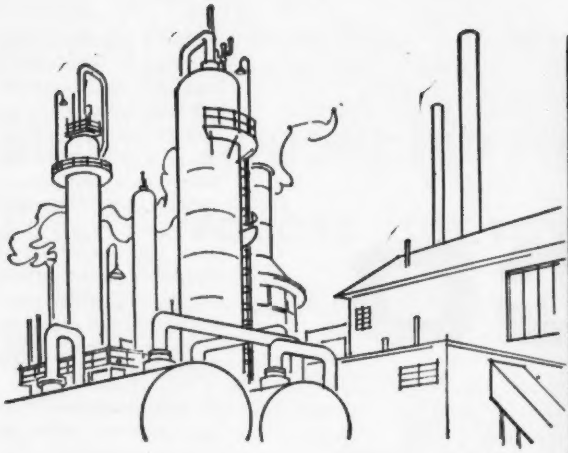
The other bill, offered by Parliament member A. Cremisini, president of Farmochimici, would allow patents only for processes discovered after his law is passed. It would allow anyone to get permission to copy a process by merely sending a registered letter to its owner and paying royalties.

Foreign firms could patent their products in Italy, provided patents were obtained in their respective countries under conditions similar to those expressed in his bill—which is tantamount to saying that they can't patent their products in Italy.

Pharmaceutical Football: The issue, of course, is a political football. Aside from the pressure from the companies that would be crimped by a patent law, opposition is strong from the powerful Left. Communist Senator Piero Montagnani, for example, claims that Italian antibiotic prices are already too high and that a patent law would really be in the interest of industry and not the public, giving birth to monopolies that would choke off small producers.

But Montagnani says that "if a patent law would guarantee against the formation of cartels and create employment within the industry, then the Communists, representing one-quarter of the whole Italian Parliament and Senate, would favor a drug process law, since it would stimulate research."

Sooner or later, it seems, Italy's pharmaceutical manufacturers will be granted some sort of process protection—along with the opportunities and challenges that will come with it.



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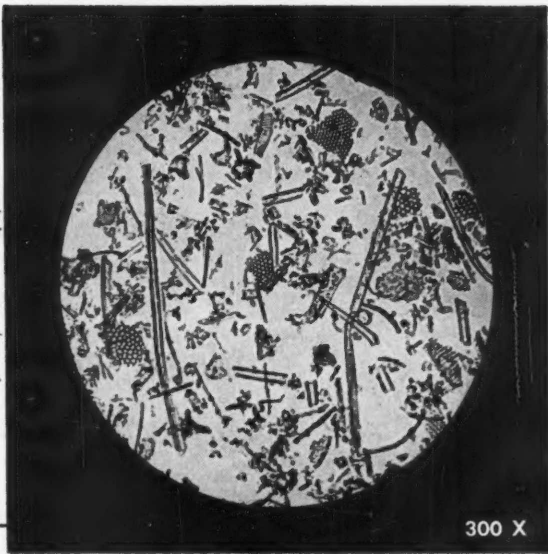

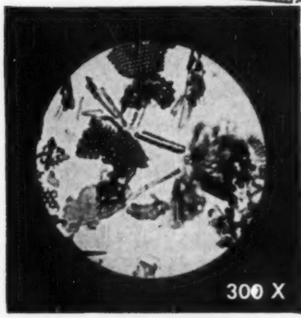

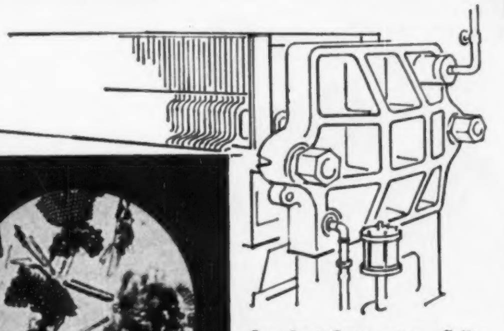

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Manufacturing Licensees throughout the World

Mobile Logger Moves in On Plant Process Improvement

At the 53rd annual meeting of the American Institute of Chemical Engineers in Washington, D.C., this week, Monsanto Chemical is revealing details of its new mobile data logger. The unit adds new versatility to chemical plant process investigations, helps improve process operations by solving problems with computer speed without requiring that a computer be hooked onto the process stream.

As Monsanto employs it, the logger, a large boxlike trailer, is moved up to a process unit and tapped into the process stream at up to 60 points simultaneously. From each of these points, a measurement such as pressure, temperature or chemical composition is fed into the unit where it is converted into a digital signal and recorded on magnetic tape. The tapes are then hustled off for analysis to a computer—at Monsanto's St. Louis home base or at a local facility where computer time has been rented.

Monsanto won't detail the information it is getting from the computer or tell what processes the logger has been used for. But Research Scientist John Draffen of Monsanto's Texas City plant, where the logger first went into operation in August, reveals that there are two major uses for the information—(1) in improving the control of process operations; (2) in developing empirical differential equations that will confirm facets of process theory. The latter could lead to improved processes, might help set up computer-controlled processing in the future.

And the AIChE paper, prepared by Draffen and Texas City Research Engineers Joe Jansen and Marliss Bird, offers clues to more detailed use of the logger. The paper points out that the new logger differs from the few mobile loggers that have previously been built. Monsanto developed it* with an eye to broad, general-purpose plant investigation, combining the steady-state and dynamic-analysis functions of earlier mobile loggers to increase the versatility.

A look at some other data loggers points up the differences. Imperial Chemical Industries Ltd., for example, built a conventional, steady-state data logger mounted in a trailer. It emphasized the recording of a large number of variables with high accuracy. But collection rate was slow and little information was obtained on dynamic relationships—e.g., the part time plays in relation to the change in the variables. And Shell designed a logger for dynamic analysis, emphasized the recording of changes in a small number of variables with time—where sensitivity is more important than absolute accuracy.

Speeding Evolution: Although Monsanto has not indicated whether it has done so yet, it could combine steady-state and dynamic analysis, use its mobile logger to run "evolutionary operation" experiments more quickly, deal effectively with the time variable in operating changes (*CW, Oct. 24, '59, p. 75*). The logger could gather data, actually have the computer set up the EVOP program.

And dynamic analysis can help solve the tricky catalyst problems. The falling off of catalyst efficiency —decay—means that there is no such thing as steady optimum conditions; the best operating conditions are constantly changing.

Big Choice: Whether Monsanto will actually use the new mobile logger for data gathering for EVOP-type programs and catalyst-decay studies is a matter of conjecture, of course. But by picking Texas City—with its large concentration of continuous petrochemical processes—as the plant for first use of the logger, Monsanto has assured long, hard usage of the unit.

So far, however, Texas City has not had all the desirable equipment. It has an IBM 650 computer, but this can't process tapes. The original plan was to send the tapes to Monsanto's IBM 704 computer in St. Louis. But because computer time is always at a premium, tapes are also being processed on a local computer where time can be rented.

Monsanto could have gotten around the computer-time jam by tying a computer directly to the logger—there is room inside the trailer for a small, digital computer in the 2,000-word memory class. And if delays in data processing couldn't be tolerated, there is no question that a computer would have to be added. In fact, one major Southwestern chemical processing company is reported to be using a complete mobile logger-computer setup already. And a computer maker is designing a complete mobile setup.

But cost of these special units is a major problem. And since the units that are built today are all prototypes, their costs are considerably higher than what would be expected of a production item. (A mobile logger cost of over $50,000 would not be uncommon.)

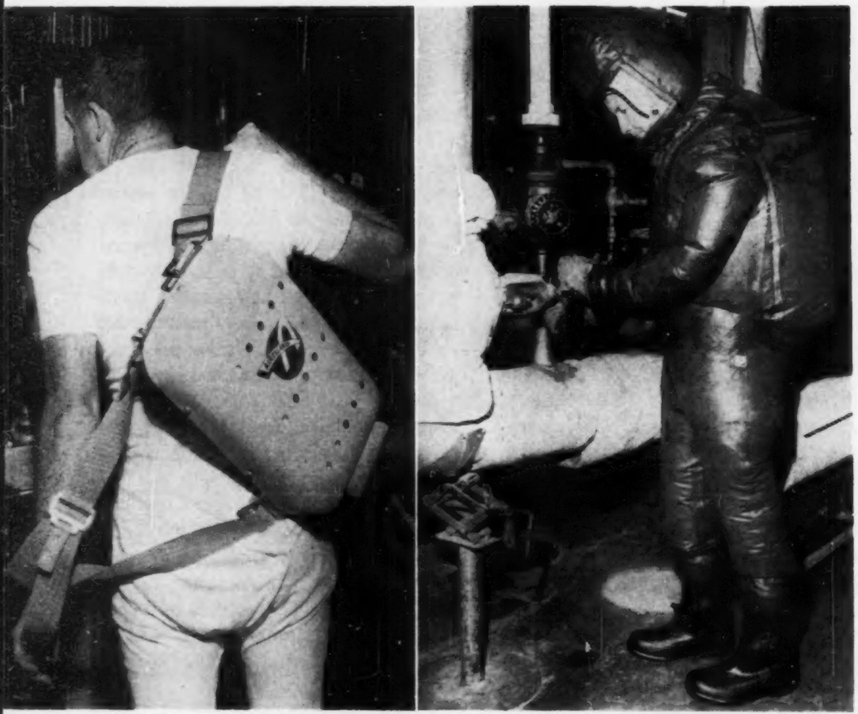
Logger costs increase directly with the total rate of collection of data. The cost of recording a large number of variables at high speed would be prohibitive. Monsanto tried to strike a balance between speed and the number of variables, limited the number of variables that can be recorded rapidly, allowed for a larger number of variables recorded at slower speeds.

Another factor that bears on the cost of a logger is the cost of computer time on a large digital computer. The computers are fast, but not instantaneous. The quantity of data being processed must be limited to keep computer time to a minimum. The logger must be designed to collect at the best rate for the computer.

But logger design costs aren't the only problem. Once a unit is built, there is a problem of measurement. Most processes are instrumented well enough to cause few problems in taking physical measurements. But chemical analysis is another matter. Even today, most of the onstream analyzers, such as the gas chromatograph, are not continuous—and in dynamic analysis studies there is a need for continuous analysis.

It looks as if mobile data logging is here to stay. But only the larger companies appear to be in a position to pay the development costs that will result in eventual payoff.

* Detailed equipment design and construction was done by Southwestern Industrial Electronics Co., Houston, Tex.



Worker puts on self-contained air supply under protective suit.

Suiting Up for Toxic Tasks

At New York's Savoy Hilton Hotel last week, The Garrett Corp.'s AiResearch Manufacturing Division (Los Angeles) demonstrated a new life-support system that may be a part of the well-dressed chemical plant worker's suit of the future for hazardous process areas.

The system, a liquid-air storage vessel and circulating equipment, weighing 17 lbs., is strapped onto the worker's back under a protective suit (*photos, above*). It permits him to work in toxic areas for up to two hours without restrictive air tubes and lines that were previously needed to support breathing (*CW, June 15, '57, p. 102*).

The self-contained environmental control system was developed by Garrett for use in handling toxic missile fuels. But Garrett engineers look for its wide use in the chemical industry, in fire-fighting, mining and in nuclear plants.

A special design of the system, called Moon Pac, is being tested for space travel. The unit, which will use oxygen instead of liquid air, has a six-hour supply. It weighs 50 lbs.

The complete control system includes a liquid-air or oxygen storage vessel and gauge, an ejector for circulating air, a heat exchanger for cooling recirculated air and a trap for collecting solids and entrained water.

How It Works: Warm air returning from the worker's protective suit passes through a finned-tube heat exchanger where it warms and vaporizes the liquid air feeding from the storage vessel. Cold (make-up) air at 150 psi. (gauge) passes through an ejector to furnish a pressure head to maintain flow through suit, heat exchanger, water trap, valves and lines.

Garrett will supply both environmental control system and the protective suit. Suits can be made for a variety of chemical atmospheres. Depending on the type of atmosphere, the liquid-air storage tank and control system may be worn over or beneath the protective suit. Costs are not available at the present time.

The compactness of the system and the possibilities of environmental control that it offers, could be big attractions for chemical firms.

EQUIPMENT

Aluminum Fittings: Forged aluminum pipe flanges are a new addition to Flowline Corp.'s (New Castle, Pa.) line of aluminum butt-weld fittings. The flanges are made for ½- through 24-in. pipe sizes of 3003-F and 6061-T6 aluminum alloys. Types available: welding neck, slip-on, lap-joint, threaded and blind.

•

Small-Diameter Fittings: Aeroquip Corp.'s Marman Division (11214 Exposition Blvd., Los Angeles 64) is out with a new type of fitting for small-diameter pipe and tubings used in extreme operating conditions. The fittings are said to provide leakproof sealing at temperatures from —450 F to 1500 F and pressures up to 16,000 psi. The all-stainless-steel union is suggested for joining pneumatic, hydraulic, cooling, heat-transfer, pressure and vacuum lines. It can also be used as a transition joint for connecting dissimilar metals.

•

Depressuring Valve: Shand and Jurs Co. (2600 Eighth St., Berkeley 10, Calif.) says its new Model 4280 depressuring valve is completely fail-safe, has been designed for high-pressure service to meet the requirements set forth in American Petroleum Institute's RP-520 tentative standard. The disc-type valve is energized by pressure in the vessel being protected. The valve opens when pressure above the disc is vented by fusible plugs, control instruments or manual control.

•

Air Sampler: Gelman Instrument Co.'s (Chelsea, Mich.) new air sampler has a quick-disconnect plastic fitting for loading filter holders in the laboratory and making changes in the field without contamination. The sampler weighs 8 lbs., has a vacuum pump, flowmeter and filter holder. The unit draws up to 16 liters/minute of air through a paper filter, operates on 110 volts ac.

•

Miniature Recorder: Thomas A. Edison Industries' Instrument Division (61 Alden St., West Orange, N.J.) is out with a new miniature circular chart recorder. It is 3¾ x 3¾ in. across the face, 3 in. deep. The recorder is direct reading, requires no amplification of signals. It records with a stylus on pressure-sensitive paper.

THE LITHIUM REACTOR

CURRENT INFORMATION ON LITHIUM CHEMISTRY AND METALLURGY

LITHIUM HYDRIDE IN NEW FORMS FOR SPECIAL USES

As lithium hydride continues to find important new applications in many fields, there has been an increasing demand for this material in special shapes. Due to the high shrinkage on solidification, casting is not a suitable technique. LCA has successfully used compression methods to fabricate these shapes from the powdered material.

One important area of use is that of nuclear shielding. For this purpose, in addition to pure lithium hydride shapes, LCA has prepared shapes by pressure molding a mixture of approximately 80% lithium hydride and 20% polyethylene. Along with better molding characteristics, this product also has better resistance to attack by atmospheric moisture.

LCA has produced both products in a variety of shapes, such as sheets, blocks, cylinders, etc. With proper precautions the molded product can be machined to moderate tolerances. The density is approximately 95% of theoretical.

These products are prepared to your specifications on a custom basis. Write to Sales Service Division, 500 Fifth Avenue, New York 36, for quotations.

RESEARCH PAPER PUBLISHED

A contribution from the LCA Research Laboratories entitled, "Effect of Sodium in the Preparation of Organolithium Compounds," by C. W. Kamienski and D. L. Esmay, was published in the J. Org. Chem., *25*, 1807 (1960).

Attempts to prepare *p*-dimethylaminophenyllithium by reacting *p*-bromodimethylaniline with lithium metal in ether were unsuccessful when the metal contained less than 0.005 wt. % sodium. When the lithium contained about 0.02 wt. % sodium excellent yields (over 95%) were obtained. Studies on the preparation of *tert*-butyllithium in *n*-pentane showed that yields over 80% could be obtained consistently providing the lithium metal contained about 2% sodium. The ease of preparation of n-butyllithium and phenyllithium was found to be affected to some extent by the sodium content of the lithium. Reprints are available.

LITHIUM METAL—As You Like It

Recent years have seen a growing interest in the use of metallic lithium on the part of both the chemical and metallurgical industries for its properties as a catalyst, as the basis for preparation of organolithium compounds for use in organic synthesis, as a degasifier in purification of copper, and for alloying with light metals to form high strength-to-weight ratio alloys.

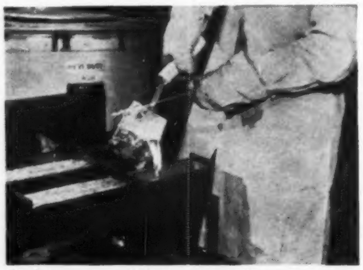
With the needs of the chemical industry in mind, LCA fabricates lithium metal in a variety of shapes and forms to meet customer requirements.

The volume consumer is favored by the trapezoidal ingot which excels in handling convenience and compact packaging. This two pound ingot measures $10\frac{1}{2}$" in length, $3\frac{1}{8}$" in depth, and 3" median width. Medium volume requirements are met by the extruded $\frac{1}{2}$" diameter rod.

The research worker has a choice of $\frac{1}{2}$" x $\frac{1}{16}$" ribbon, $\frac{1}{8}$" diameter wire, granular metal shot, or metal dispersions in oil or wax. These forms are packaged to meet demands for both research and production quantities.

The regular grade lithium metal is exceeded in purity on the commercial market only by LCA's low sodium grade. The low sodium metal is available in all forms at a nominal premium.

A custom service provides special cast shapes, specially loaded containers, and even lithium chemical intermediates for customers requiring them in some quantity.



Lithium metal being cast into ingots at the Company's new Bessemer City, North Carolina plant.

LCA supplies lithium metal in ingot, ribbon, wire and rod forms.

LITHIUM IN BRIEF

New developments involving lithium are constantly appearing in the literature. Each month some will be mentioned briefly here.

•

Electrorefining of beryllium uses a fused salt bath comprised of lithium, potassium and beryllium chlorides. (3758)

•

In the catalytic polymerization of isoprene with butyllithium, kinetics and temperature effects were studied. (3672) Properties of various lithium-based greases are tabulated and discussed. (3793)

•

Most commercial thermistor materials contain traces of lithium oxide, according to a report on their theory, manufacture, and application. (3784)

•

Kinetics studied of the initiation and propagation of polymerization of styrene by butyllithium in benzene. Activation energies estimated. Spectra of polystyryl-Li species determined. (3806)

•

Greater selectivity in lithium metal-amine reductions may be obtained by using mixtures of amines. (3711)

•

A fused electrolyte of cerium, barium, and lithium fluorides is used for the electrolytic production of high-purity cerium metal from cerium oxide. (3780)

•

The solubility of nitrogen and oxygen in molten lithium metal has been determined at various temperatures, and methods for the removal of these impurities were investigated. (3480)

•

For further information, write our Technical Service Department, Bessemer City, N. C.

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Technology
Newsletter

CHEMICAL WEEK
December 10, 1960

New cost figures on the production of hydrazine directly from ammonia via nuclear fission were revealed this week by Aerojet-General Nucleonics (San Ramon, Calif.) at the American Institute of Chemical Engineers meeting in Washington, D.C. AGN now claims its process can produce hydrazine for 25¢/lb. instead of its originally forecast price of 50¢/lb. (*CW Technology Newsletter, Aug. 20*). This compares with the current price of about $2/lb.

Meanwhile AGN's program to prove out the system with experimental tests is apparently on schedule and nearing completion. First runs were made this week with a capsule in the Livermore Pool Type Reactor. Scheduled tests include operations at low neutron flux and high neutron flux, are expected to be completed by the end of month. Analysis of the tests is scheduled for completion in January.

Since the Livermore tests are only batch-type, an important part of the 25¢/lb. claim hinges on the development of a successful continuous process. AGN has already calculated such a process based on use of uranium dioxide to provide a fissio-chemical reaction in liquid phase (which would be run at pressures high enough to keep anhydrous ammonia liquefied).

•

A fluid catalytic cracking unit at Standard Oil of California's El Segundo, Calif., refinery is running under the open-loop control of an IBM 7090—first control job for this computer, which is 300 times faster than the IBM 650. The computer in San Francisco, 450 miles away from the plant, is tied to the 40,000-bbls./day unit via a system of leased telephone lines, over which the computer supplies recommended process control settings every 15 minutes. For these settings it receives 50 instrument readings every 72 seconds.

Besides running the process efficiently, the computer is generating data and know-how for another computer to take over. This second one will probably be the new process control computer that IBM is coming out with in January. Its first assignment: to run the Standard Oil (Ohio) plant at Whiting, Ind. (*CW, Oct. 22, p. 31*).

•

The lowest cost yet reported for a process to purify saline water is 38¢/1,000 gal. in a 10-million gal./day plant. The new estimate is for a direct freezing process (salt brine is washed from the ice crystals, which are then melted to produce fresh water). The process was evaluated by Cornell University for the Dept. of the Interior's Office of Saline Water, and will be used in a 35,000-gal./day pilot plant that Blaw-Knox Co. (Pittsburgh) is building at St. Petersburg, Fla.

The previous low cost estimate for sea-water conversion was 42¢/1,000 gal. through use of a 50-million-gal./day nuclear-powered

plant. This cost figure was developed by Fluor Corp. (Whittier, Calif.) in a study of a plant that would employ a multistage flash evaporator and a light water-moderated and -cooled nuclear steam generator. Government spokesmen tell CHEMICAL WEEK that the 38¢ figure is "perhaps too optimistic." (For news on Koppers Co.'s salt-water conversion process, see p. 106.).

•

Abbott has quietly dropped marketing of dialdehyde starch because of the material's high production cost. In Abbott's opinion considerably more applications research remains to be done, although the product shows much promise. Meanwhile USDA's Northern Regional Research Laboratory (Peoria, Ill.) has come up with a dialdehyde starch derivative that forms good coatings on glass, metal and wood. It features resistance to boiling water and most organic solvents.

•

Pilot-plant production of a new polysaccharide gum, called B1459, is now under way at Abbott Laboratories (North Chicago) and Kelco Co. (San Diego, Calif.). The nontoxic gum imparts high viscosity, is not salt-sensitive and withstands temperature extremes. This adds up to potentially broad markets in stabilizing creams and emulsions (e.g., in formulating toothpastes and cosmetic lotions). It could also find use in textile finishing. Target price: 75¢-$1.50/lb. But production has hit some snags (the gum must be handled at low concentrations at commensurate low yields), so the commercial marketing date is still indefinite.

•

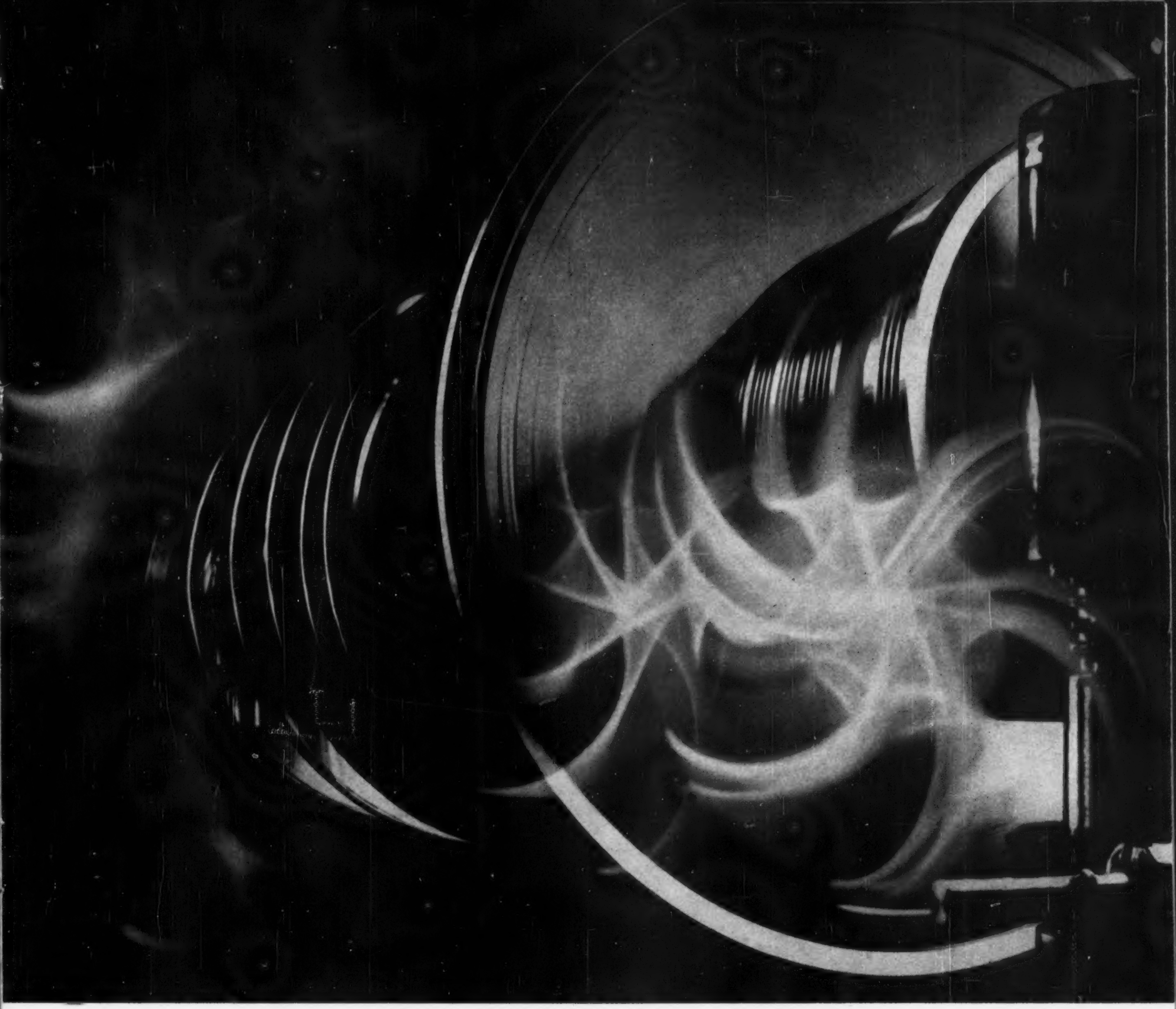
Record power from double-base missile propellants has been hinted by the Navy. Secret is a new propellant, tagged 2056-D, made at Navy's Indian Head, Md., plant, and developed to boost the range of the Polaris missile to 2,500 miles. Indian Head makes only the base grain powder, which is furnished to Aerojet-General Corp. and Allegheny Ballistics Laboratory for testing in the Polaris research project. The 2056-D plant cost $3 million, can turn out 160,000 lbs./month of propellant. It will likely be in full production within a few months.

•

New way to recover oil from Athabasca, Can., tar sands has been worked out by Electro Frac Corp. (Kansas City), a division of Kewanee Oil Co. Electrodes are put deep into the sands about 100 ft. apart and controlled amounts of oxygen pumped down into the sands. Then 3,000 volts of electricity are applied to the electrodes, starting a fire. The resulting gases force the oil to the surface.

•

A pocket-size, all-electric sheet glass furnace (capacity: 10-40 tons/day) is being piloted by Penberthy Instrument Co. at Olympia, Wash. If the process is successful, it may open the way to on-the-spot glass plants throughout the country, which would avoid the disadvantage of high freight rates.



Turbine rotor on dynamic balancing machine—special photographic impression

HOW TO BALANCE "n" TURBINE VARIABLES

This rotor was designed in light of the "n" variables that affect turbine design. No one really knows the number—each installation is different. But they begin with steam pressure and temperature, exhaust steam pressure(s), horsepower and speed requirements, controls, efficiency requirements, and, of course, the nature of the individual application.

Balanced properly, these variables will produce extreme reliability—what we at Worthington believe to be the single most important factor in turbine design.

Balancing these factors in design is, of course, the work of power engineers and turbine specialists. But, it is desirable to have *every* person who is engaged in selection, operation and maintenance familiar with the many factors in mechanical drive turbine design. To help those of your people concerned with turbine application we have just prepared "Let's Talk Turbines." It's a primer on API specifications and other subjects such as turbine types, construction, governing systems and lubrication methods. Write Worthington Corporation, Section 48-12, Wellsville, N. Y.

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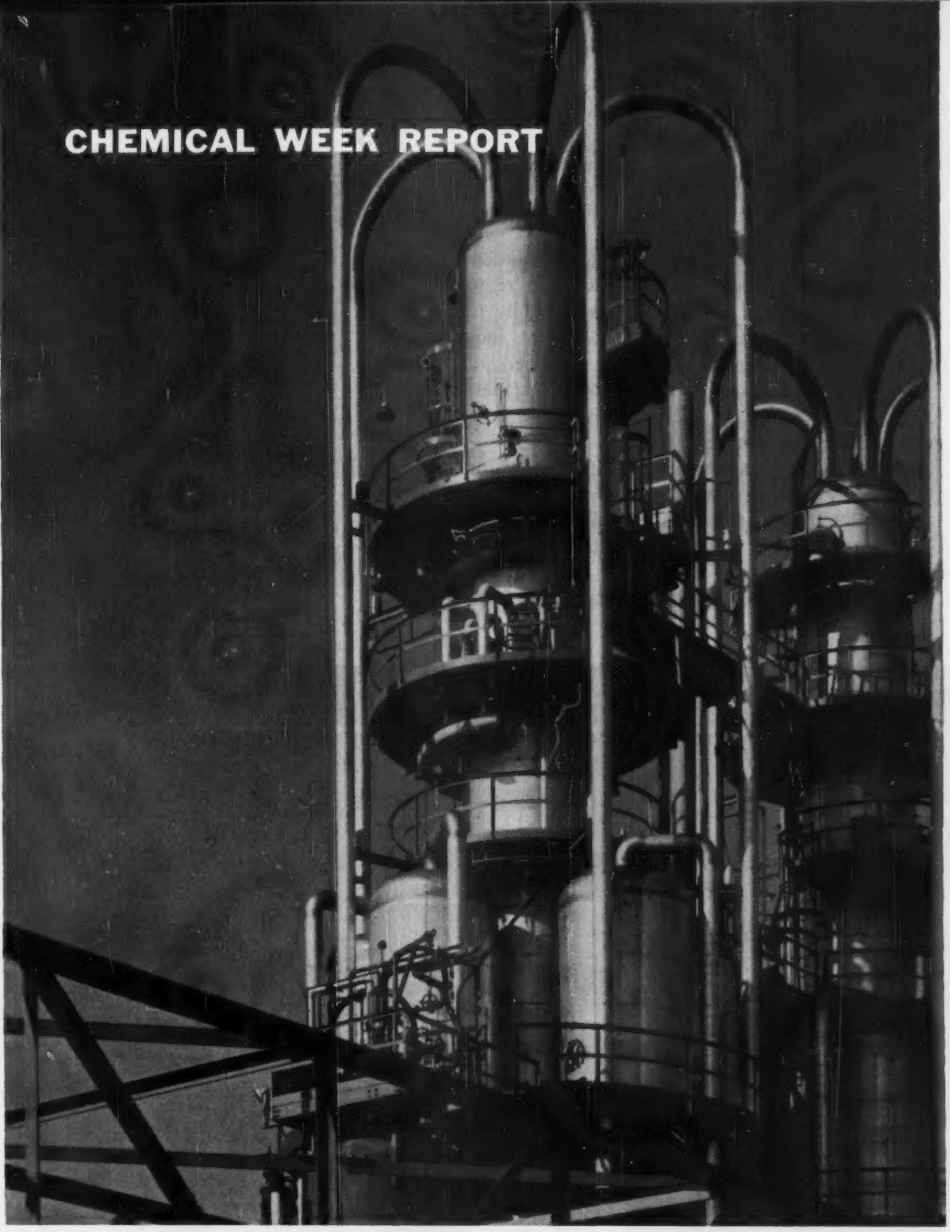


Reichhold's new Elizabeth, N. J., plant points up current phthalic building boom

PHTHALIC ANHYDRIDE

Coming up for phthalic: a construction "explosion"; a modest increase in demand; an era of plenty in raw materials and changing production technology. Here's the big picture:

THERE'S a strong worldwide push to boost phthalic anhydride capacity. World capacity has doubled since '55—from 589 million lbs. to 1,154 million lbs. And by the end of next year it will be 1,650 million lbs., half again as big as it is now.

The world expansion now going on is the backdrop against which the future export market for phthalic must be assessed. It's already having a big effect on the U.S. supply of raw materials—naphthalene and ortho-xylene.

But it's the domestic buildup in phthalic capacity that is of more immediate concern. The figure given in the chart (*p. 86*) is conservative. This estimate of phthal-

ic's U.S. capacity considers only: (1) debottlenecking of existing plants, completion of which can reasonably be expected next year; (2) new plants currently under construction or contracted to be built. Not included are three planned expansions by U.S. producers that would add 105 million lbs. to U.S. capacity. This new capacity should be in place in '62; conceivably a large portion could be in by late next year.

Nor do the figures take into account production facilities for closely related isophthalic acid. They would swell today's total by as much as 80 million lbs.

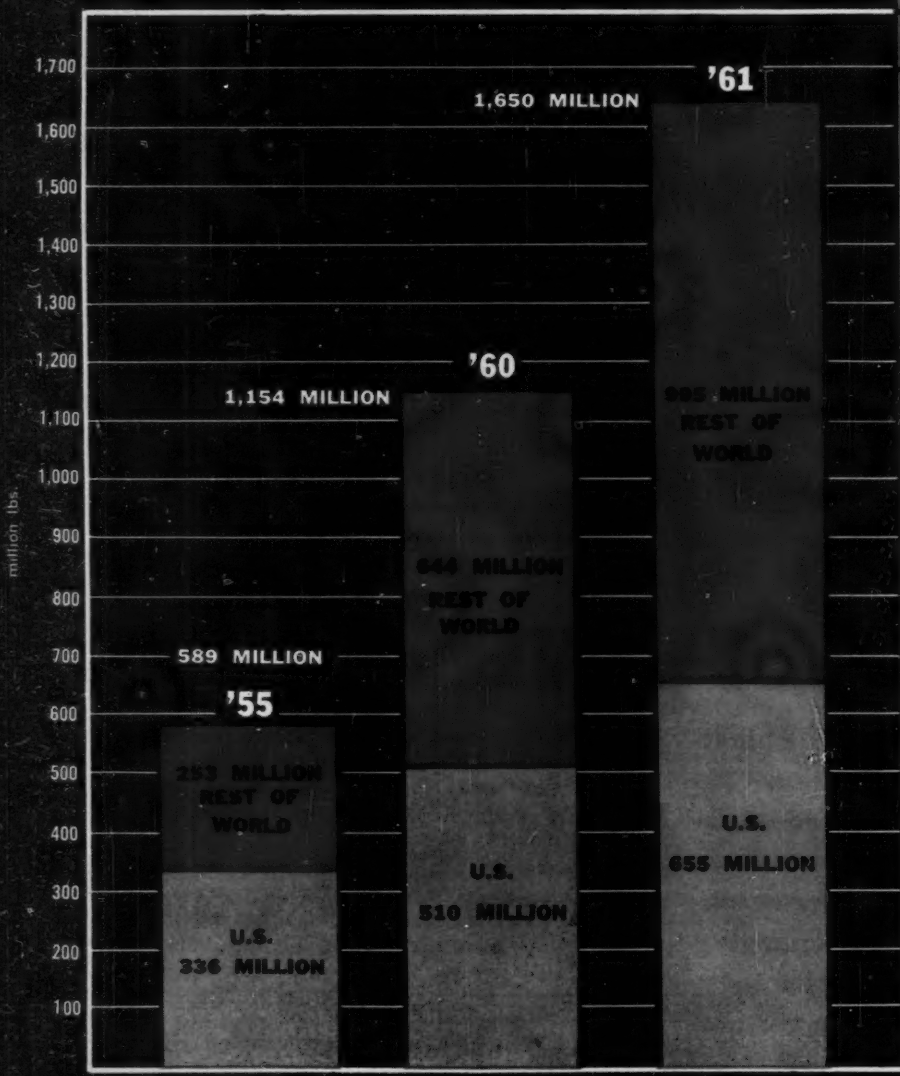
Important Shifts: Increased production capability, however, is only a small portion of the rapidly changing phthalic story. Other significant changes are shaping up in:

Growth of end-uses. Plasticizers will soon take over the top spot from alkyd resins, long the No. 1 outlet for phthalic. There's growth left in alkyds but not enough to satisfy phthalic makers. Biggest growth, in percentage and poundage, will have to come from polyesters.

Raw materials. Phthalic is cutting loose from its historic dependence on coal-tar naphthalene, produced in this country and imported. Three refiners are planning petroleum naphthalene plants that will add 375 million lbs./year to the country's naphthalene supply. Two other plants are under serious consideration. Those plus better-than-planned operation from at least one of the plants now being built could add 210 million lbs./year by '62.

Production of ortho-xylene, alternate raw material for

World Phthalic Anhydride Capacity Takes a Big Step



World Phthalic Capacity '61

Country	Production (million lbs., est.)
U.S.	655
W. Germany	154
Great Britain	121
U.S.S.R.	132
Italy	128
Japan	118
France	77
E. Germany	74
Czechoslovakia	20
Poland	33
Australia	26
Austria	10
Spain	8
Belgium	20
Brazil	6
Mexico	9
Canada	17
Holland	10
Hungary	5
Argentina	5
Switzerland	10
S. Africa	2
Sweden	7
Denmark	2
Colombia	1
Total	1650

phthalic, will probably come to 95 million lbs. this year. Capacity will be nearly six times that by the end of next year. The increase, however, is slated for shipment to overseas phthalic producers. This will be enough raw material to supply almost one-half the phthalic capacity that will be in place outside the U.S. by the end of next year.

Processing. In the past, phthalic makers, with few exceptions, designed their plants to oxidize coal-tar naphthalene. Today they have a choice of using much purer (and more expensive) petroleum naphthalene. New plants have a choice of two versions of fixed-bed processes, two versions of a fluid-bed process. And fixed-bed plants have a choice of naphthalene or ortho-xylene—or a mixture of the two.

CAN DEMAND CATCH UP?

The urgent problem facing phthalic makers is how to supply their customers. For some time now, they've been able to fill only one-half their orders. But this is due to a shortage of naphthalene rather than to any lack of phthalic capacity. This situation will change next year, probably in the second quarter, when petroleum naphthalene becomes available. It could change even faster, of course, should steel production pick up, making more naphthalene available.

The longer-range problem is whether demand for phthalic will grow fast enough to take up the new capacity. And the only way to arrive at an answer to that is to look at the current picture and potential growth uses:

U.S. Phthalic Producers, Capacities, Plants and Processes

Producer	Plant	Capacity (millions lbs./year) Now	1961-62	Process
Allied's Plastics and Coal Chemicals Div.	Frankford, Pa.	75	100	Fixed-bed naphthalene
	Ironton, O.	35	35	Fixed-bed naphthalene
	Chicago, Ill.	35	35	Fixed-bed naphthalene
	Los Angeles, Calif.		25	Contract not awarded
Allied's National Aniline Div.	Buffalo, N.Y.	12	12	Fixed-bed naphthalene
American Cyanamid	Bridgeville, Pa.	65	65	Cyanamid fluid-bed naphthalene, also some fixed-bed naphthalene
Amoco***	Joliet, Ill.	15	15	Liquid-phase ortho-xylene
Hatco Div. of W. R. Grace	Fords, N.J.		30	Sherwin-Williams-Badger fluid-bed naphthalene
Koppers-Pittsburgh	Kobuta, Pa.	23	25	Fixed-bed naphthalene
Monsanto	St. Louis, Mo.	70	70	Fixed-bed naphthalene
	Everett, Mass.	40	40	Fixed-bed naphthalene
	Gloucester County, N.J.		40	Sherwin-Williams-Badger fluid-bed naphthalene
Oronite Division of California Chemical**	Richmond, Calif.	18	18	Fixed-bed ortho-xylene
Pittsburgh Coke	Neville Island, Pa.	36	60	Fixed-bed naphthalene*
Reichhold	Azusa, Calif.	10	10	Fixed-bed naphthalene
	Detroit, Mich.	20	20	Fixed-bed naphthalene
	Elizabeth, N.J.	30	30	Sherwin-Williams-Badger fluid-bed naphthalene
	Newark, Ohio		60	Contract not awarded
Sherwin-Williams	Kensington, Ill.	6	10	Fluid-bed naphthalene
Thompson Chemical	Pawtucket, R.I.		10	Foster Wheeler fixed-bed naphthalene
Witco	Chicago, Ill.	20	20	Scientific Design fixed-bed naphthalene
	Perth Amboy, N.J.		30	Scientific Design fixed-bed naphthalene ortho-xylene
Totals		510	760	

*A de-bottle-necking due to be completed early next year will boost capacity by 10%. The 50% increase is scheduled for 1962 but no decision has been made whether it will be a new plant or an expansion of the present one.

**Oronite Division also has an isophthalic acid plant initially rated at 50 million lbs./year capacity.

***Amoco slated to make isophthalic acid, has plant of 30 million lbs./year capacity.

CW REPORT

Preliminary figures for the first seven months of this year indicate alkyds took 39% of the domestic supply. Plasticizers took the same share; polyesters accounted for 7-8%; dyes, drugs and miscellaneous took the rest. Total supply was 219 million lbs. (228 million lbs. of domestic production, plus 3 million lbs. of imports, less 12 million lbs. of exports). At that rate U.S. production would have hit 395 million lbs. this year, all of which could probably have been consumed.

For gauging phthalic's present and future, however, '59 is a better year—because figures for the full year are available and because it was more nearly a normal year, despite the 116-day steel strike. Domestic supply last year was 370 million lbs., of which alkyds used approximately 44%; plasticizers, 39%; polyesters, 7.8%. Of the remaining 33 million lbs., dyes consumed approximately 15 million lbs., drug and miscellaneous chemicals the remainder (*see charts, p. 91*).

Here's how these markets shape up for the next five years:

Alkyd resins. Long the biggest single outlet for phthalic, alkyds owe their popularity to a rare combination of good properties and low cost. Newer coatings, such as acrylates and melamines, have made inroads into some jobs traditionally held by alkyds. By the same token, blends of alkyds with the new materials, and other developments, may help boost the total demand. For instance, a new Du Pont acrylate paint for house exteriors calls for an alkyd primer on previously painted surfaces. Other alkyd blends may give it a foothold in the exterior paint market too.

Water-thinned straight-alkyd emulsions have not taken over a significant fraction of the paint market. But considerable work has been done on water-soluble alkyds of the baked enamel type.

Success in making and marketing such a coating could be a tremendous boon to the fortunes of phthalic. But counting on it is not realistic. The outlook is that alkyds will have a modest growth over the next five years and will take approximately 175 million lbs. of phthalic in '65.

Plasticizers. Phthalic is used to make a number of phthalate plasticizers, notably DOP (dioctyl phthalate). Tied largely to the increase of polyvinyls, the plasticizer consumption of phthalic has been growing at the rate of 5%/year for the past five years. Continuation of this trend puts phthalic use in plasticizers at 175 million lbs. by '65.

Polyesters. The fastest-growing customer for phthalic has been polyester resins. But because this accounts for such a small portion of the total, the rapid rise of polyesters will not have a dramatic impact on phthalic for some years. Projecting its past growth rate puts phthalic needs for this purpose at 81 million lbs. in '65.

Miscellaneous. Dyes provided the original impetus for phthalic manufacture in the U.S. shortly after World War I. They still account for a fair market. It takes, for example, 1 lb. of phthalic to make 1 lb. of phthalocyanine dyes. This meant a '59 market of 7 million lbs. Other dyes and colors, such as those based on anthraquinone, took probably 8 million lbs. that year. This will grow to 22 million lbs. in '65.

Chlorinated products, pharmaceutical intermediates and a number of other small uses accounted for the remaining 18 million lbs. of supply.

Chemagro's new Guthion insecticide uses phthalic. But it's not likely to become a really significant consumer of phthalic in view of the projected capacity. Other than that, there are no new, bright uses on the horizon for phthalic, and the miscellaneous category for phthalic uses will not take appreciably more in '65 than is taken now.

Gapmanship: The total demand for phthalic, then, in '65 should come to 490 million lbs. That's a respectable growth rate. But it's not early enough to justify the current building program. Growth at the projected rate means that U.S. demand during '62 would reach 425 million lbs. At the time, if all present plans materialize, capacity will be a whopping 760 million lbs.

Measuring this difference between capacity and demand is causing considerable concern among phthalic makers now. It's also causing some remarkable exercises in "gapmanship."

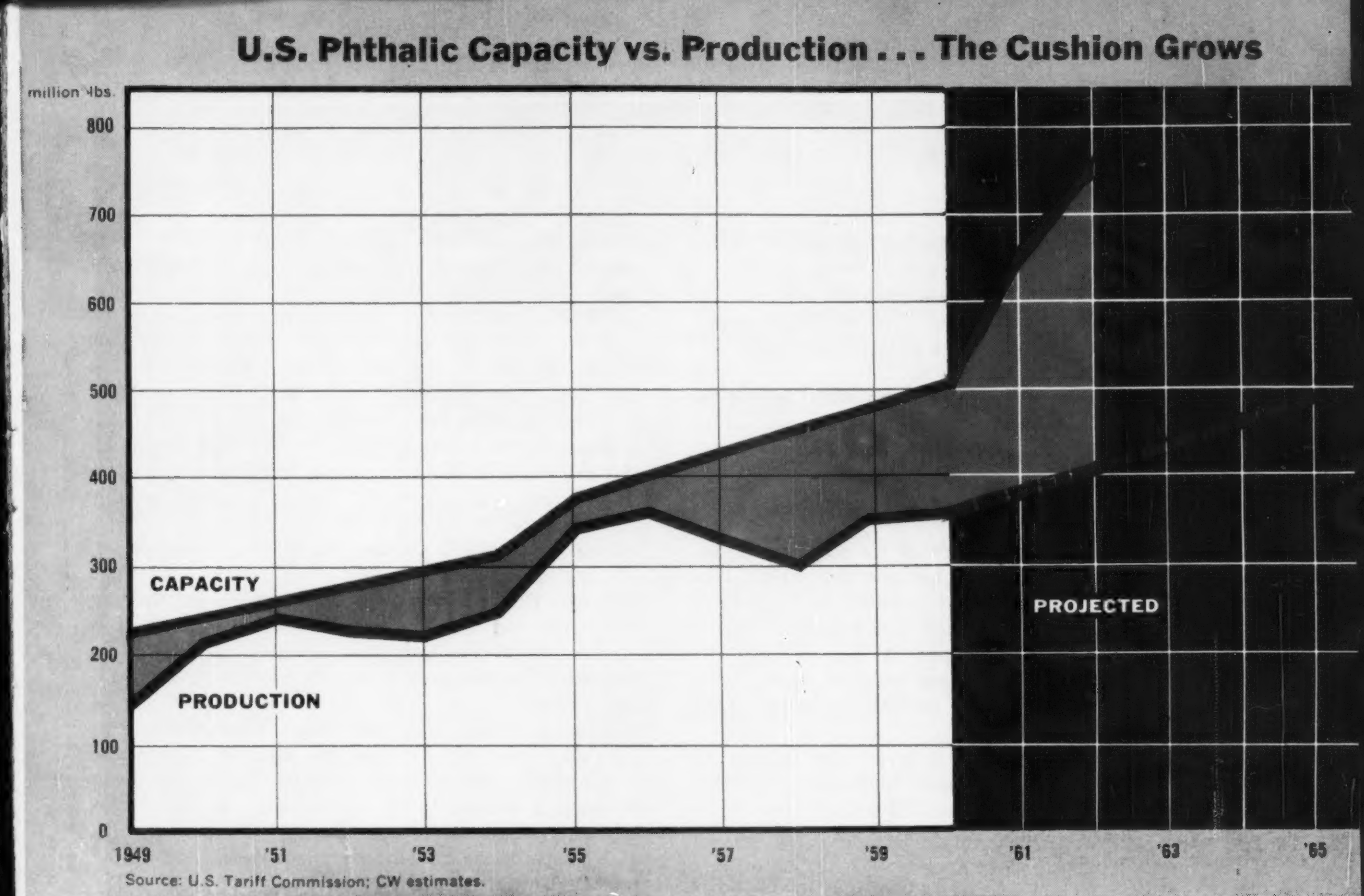
The optimistic school looks at it this way: March of this year was a good month; naphthalene was available and phthalic producers could sell all they could make. Yet, they made only 36.6 million lbs. Extrapolating that for a year (and making due allowance that March has 31 days) gives an annual production of 431 million lbs. Based on a capacity of 510 million lbs., that figures to an operating rate of 84%.

Looking ahead to '65, the reasoning continues, an export market of possibly 30 million lbs. should be added to domestic requirements. Thus, with a 520-million-lbs. demand, producers should be able to operate at a 69% level, even with a 760-million-lbs. capacity. Although short of the ideal, the optimists conclude that making and selling phthalic will be a highly satisfactory business.

One difficulty with this view is that some of the plants were still relatively new in March. Witco's and Reichhold's New Jersey plants did not get started until late last year. Amoco certainly was not near capacity. So March does not accurately reflect what the industry could do now.

And even the most optimistic must concede that starting in '62, when the additional capacity makes itself felt in a big way, there will be a more-than-comfortable capacity surplus.

There are, in addition, some questions about the possibilities of increasing and holding onto the export market. This depends, of course, on demands in overseas countries and foreign producers' ability to meet it. The broad view: U.S. per-capita consumption is more than 2 lbs., while for the rest of the world it's less than ½ lb. An increase in per-capita consumption outside the U.S. to 1 lb. would mean a world market of at least 1.3 billion lbs.



The imponderables concerning this view are two: The ½-lb. per-capita consumption may more accurately reflect the possible consumption of phthalic in light of lower living standards. Also it does not reckon with the growth rate of consumption, which would have to be phenomenal to keep pace with the projected capacity increase.

The Place of Iso: Another factor clouding the picture, at least in the U.S., is the position of isophthalic acid. Because of the current phthalic shortage many users have switched to isophthalic. Pioneer producer Oronite Division of California Chemical Co. has long promoted the material's superior qualities. At one time, isophthalic acid's price was dropped, so it was competitive with phthalic on a reactivity basis (*CW Market Newsletter, Jan. 31, '59*). It now sells for 18¢/lb. (bags, carload lots, freight equalized), while phthalic on the same basis sells for 19¢/lb. However, because iso contains a molecule of water, it would have to sell for about 17¢/lb. to be competitive with phthalic on a reactivity basis.

Whether present users stay with isophthalic or return to phthalic when it becomes freely available depends entirely on whether they find any extra qualities worth the extra price. It's conceivable, of course, that iso's price will be reduced. But with phthalic overcapacity imminent, it's likely that its price will be reduced also. And, inherently, phthalic should be a somewhat less costly product.

Amoco dubs its offering IRAA (isophthalic-rich aromatic acid). It has test-marketed it mainly to the polyester trade, where it has satisfied itself that at 17¢/lb. the material is competitive with phthalic on a mole-equivalent basis. Taking a different approach from Oronite, it feels that it has to make its product competitive with phthalic from that standpoint.

The present capacity for isophthalic is hard to measure. Normally, 30 million lbs./year is attributed to Amoco. But its process is designed to accommodate all three xylene isomers; and its capacity could vary, depending on whether it was treating a mixed feed of xylenes or whether it wanted to make one or two products preferentially. It now reports that the problems with the oxidation section have been solved, although some wrinkles remain in the mechanical operation of the plant. It's operating close to capacity on terephthalic acid. But its production of phthalic and isophthalic this year has not had a big impact on the market.

Oronite originally set plant capacity at 50 million lbs./year. But it too went through an agonizing shakedown period. The plant is operating successfully now, but there have been doubts concerning its proved capacity, whether it can actually make more than 35-40 million lbs./year.

Oronite is now seriously thinking about another isophthalic plant. But it gives no indication of the size of operation it's considering.

Captive Markets: The potential overcapacity may cause some changes in the traditional marketing pattern in phthalic as makers try to build up captive markets.

Almost all the producers have captive markets now, of course. Tariff Commission reports indicate that about one-quarter of the phthalic made in '59 was used

captively. This use of the material will probably grow.

Evidences of this are already starting to show. Monsanto is boosting plasticizer production that will take at least part of its new capacity. Allied and Reichhold bought out phthalic consumers Specialty Resins (Lynwood, Calif.) and Deecy Products (Cambridge, Mass.), respectively. Oronite bought out General Electric's alkyd resin plant at Anaheim, Calif. Newcomers to phthalic production, Hatco and Thompson are already phthalic users and, in fact, have merely integrated backwards.

SHORTAGE OF NAPHTHALENE FROM COAL

Naphthalene is in short supply at the moment for two reasons: (1) the steel industry has been operating at little more than 50% of capacity for months; this has limited coke-oven operation and production of by-product chemicals; and (2) naphthalene imports have been drying up because the buildup in overseas phthalic capacity has cut the amount of naphthalene available for export to the U.S.

The decline in imports was foreseen. But earlier this year, before steel demand dropped, naphthalene producers had high hopes of turning out 550-600 million lbs. of material. But actual output is now expected to run slightly under 500 million lbs.

The relationship between steel production and naphthalene output is not a simple arithmetical one. Starting up or shutting down a coke oven is a tricky business at best. The silica brick used for coke ovens in this country has a high coefficient of expansion at temperatures below 1200-1600 F; above that, the expansion coefficient levels off. This means that the ovens must be heated gradually (it takes six to eight weeks to prepare one for charging). And it's all but impossible to cool one all the way without cracking some brick.

So rather than shut down the oven, steel companies prefer to lower the coking temperature and lengthen the cycle. The lower temperatures result in less naphthalene. For instance, the normal cycle for a 17-in. oven would be 17 hours, at say, 2550 F (flue temperature). Lowering the temperature to 2250 doubles the coking time and halves naphthalene production. And, in processing such a tar, it's difficult to pull out naphthalene with high efficiency; more is left in both the front- and tail-ends.

Theoretically, then, when the steel industry is operating at only half capacity, naphthalene production would be cut to one-fourth of capacity. But there's a growing tendency to keep some ovens on a normal cycle and to "bank" the rest with gas. U.S. Steel does that. Bonus: it is always working with high-naphthalene tars. And, at times of reduced steel operation, it has excess tar-processing capacity, can spend more time on the stills, take more pains with naphthalene production. When operating full tilt, for example, it might be getting out only 80% of the naphthalene in the tar. Under conditions as at present this could be jacked up to 95%.

Another important consideration: tar processors can build up tar inventories during the winter, when demand for creosote and pitch slackens. This year the inventory carried them through the summer, and the naphthalene pinch didn't start to really hurt until October.

The net result is that '60 production will probably hit a record 495 million lbs. (the previous high: 491 million lbs. in '56). However, it will fall short of the rate for the first half, when production came to 280 million lbs.—at a steel operating rate of better than 70%.

Imports, which were as high as 123 million lbs. in '55, fell to 59 million lbs. last year. In the first eight months of this year, they totaled 27.7 million lbs., will probably be 40 million lbs. over the full year.

This will put the U.S. supply this year at 535 million lbs. But just how far this falls short of demand is a debatable question. The best way to get the answer is by working backwards. Assume, for example, a phthalic demand this year of 395 million lbs. About 20 million lbs. would be supplied by the two plants using ortho-xylene. The remaining 375 million lbs. would require 470 million lbs. of naphthalene (based on an 80% conversion factor).

In addition, 90-100 million lbs. of crude naphthalene would be upgraded to refined grade (the market for which is generally thought to be 80-90 million lbs./year. Beta-naphthol takes 45% of the refined product; moth balls, 25%; naphthalene sulfonate tanning agents, chlorinated products and other uses, 30%).

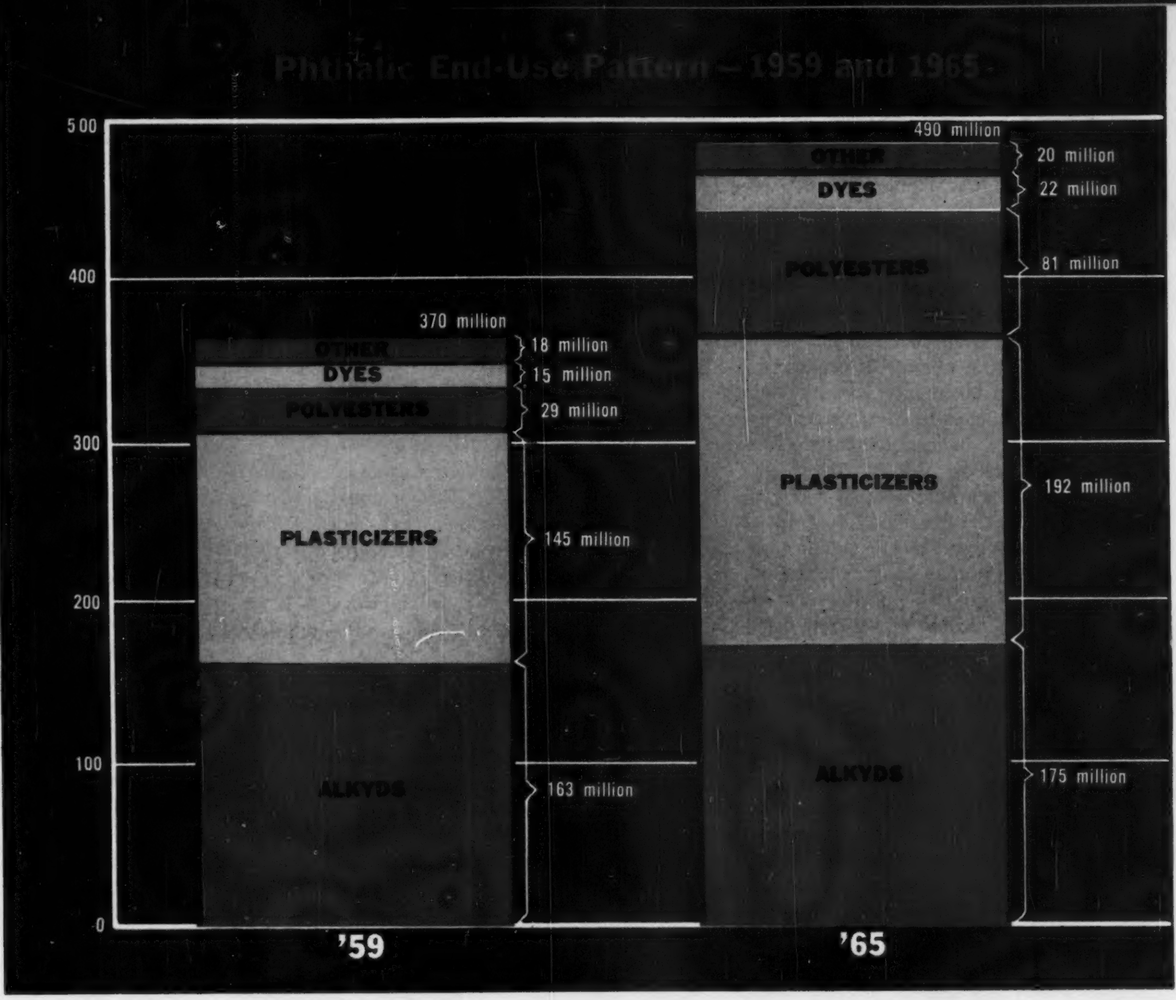
Total demand for crude naphthalene then might be 560-570 million lbs. — 25-35 million lbs. more than supply. However, the 495 million lbs. of domestic production includes some relatively low-grade naphthalene (below 74 degree). Also, there's some duplication in statistics, due to boosting the purity of the lower-grade material. So the actual shortage is somewhat larger than calculated.

A complicating factor is Carbide's demand for naphthalene to make its new Sevin insecticide. It's just about impossible to peg present requirements because of the shortage of naphthalene. And trying to put a figure on future needs is chancy at best. However, if the product lives up to its expectations, it could become the biggest nonphthalic customer for naphthalene. Next year it might take 15-20 million lbs. And in three or four years it might require 30-50 million lbs.

U.S. Steel and Koppers recently took steps to alleviate the shortage, by marketing mixtures of naphthalene and monomethylnaphthalene. U.S. Steel's product runs 80-85% naphthalene, 10-15% monomethylnaphthalene. Koppers runs 40% naphthalene, 60% monomethylnaphthalene. The new products are being used by three companies on large-scale equipment to make phthalic or as naphthalene extender in phthalic production.

Such compounds have long been recognized as potential raw materials for phthalic. A decade ago Penn State researchers investigated methylnaphthalene (as well as other tar products, including a crude tar cut, anthracene and phenanthrene) and found them capable of turning out a high-grade phthalic.

The objection to their use has been based on economics rather than on technology.



More in Sight: Their introduction is strictly a stop-gap measure. Permanent help should come next year, when petroleum naphthalene comes onstream. Ashland's plant, the first due, is scheduled to start up in February. Good weather has blessed the project and Ashland hopes to hit its target.

But, because it is such a new process, startup difficulties are to be expected, and naphthalene users are not anticipating any real change before the second, or even third, quarter.

A pickup in steel operations could bring an earlier change, of course. But even that would not mean immediate relief because coke inventories are high right now.

Help could come too if Bethlehem Steel should decide to sell some of the tar from its Sparrows Point, Md., plant. The third largest coking plant* in the country, Sparrows Point now burns its tar for fuel. But it is considering a topping operation whereby it would take off a naphthalene fraction and sell it to tar processors. This would add 35-40 million lbs./year to the nation's supply.

Potential from Coal: In a good steel year, naphthalene from coal could easily hit 600 million lbs. Even that's a fraction of the potential supply: U.S. coking capacity is now 82.5 million tons; each ton of coke produces 12.0 gal. of tar (assuming a 70% yield of coke from coal) and each gallon of tar contains about 1 lb. of naphthalene. It comes to a potential of 990 million lbs.

However, some of the tar is used for fuel and other purposes. And tar processors normally don't get more than 70-75% of the naphthalene that's in the tar. Result: the four-year ('56-'59) ratio of tar to naphthalene is 0.56. But the industry can do better. For the first seven months of this year, it was 0.70. Some feel that in a few years 0.75 will be commonplace.

Upshot, from a practical standpoint: an available supply of about 700 million lbs. of naphthalene from coal. But this would take several years to reach; 600 million lbs. is a more realistic figure for today.

The total could be raised by converting the tar's methylnaphthalenes into naphthalene. Figures for a typical tar† are 10.9% naphthalene, 2.5% methylnaphthalenes, and 3.4% dimethylnaphthalenes. The methylnaphthalenes are in the creosote and could be used as a source of naphthalene by adapting techniques used to produce petroleum naphthalene. In fact, U.S. Steel has a patented process (U.S. 2,920,116) for doing just that. Essentially it's a catalytic hydrocracking of creosote.

Putting up a plant to exploit the process is a straightforward matter of economics. U.S. Steel started on the work several years ago, before any plans were made for

* Capacity: 4,468,000 tons. The two largest: the U.S. Steel installations at Clairton, Pa., and Gary, Ind., which have capacities of 7,833,800 and 5,654,500 tons, respectively.

† R.N. Shreve, "The Chemical Process Industries," McGraw-Hill, p. 91. Tars vary greatly in composition, of course. U.S. Steel, for instance, reports that for every 2 lbs. of naphthalene, its tars contain 1 lb. of monomethylnaphthalene.

petroleum naphthalene. It's not likely that such a plant will be needed in this country.

How It Will Grow: Nor is it likely that the potential of naphthalene from coal will grow appreciably, at least for 15-20 years. A number of economic and technological trends must be taken into account, however, in pinning down probable growth. Most important:

Steel capacity. Indications that steel capacity will reach 200 million tons by '75. At an operating rate of 90%, 180 million tons would actually be produced. This is almost double the 93.4 million tons produced in '59, a little over 50% more than the 117 million tons produced in '55.

Ratio of pig iron to scrap. On the average, ingot producers now charge 52% pig iron and 48% scrap.

Coke needed per ton of pig iron. In '49, it took 1,920 lbs. of coke to make a ton of pig. This dropped to 1,588 lbs. in '59. The reduction has been made possible by the construction of modern large-scale blast furnaces that have higher fuel efficiencies as well as new ore preparation techniques. This trend is likely to continue for 15-25 years, when the amount of coke/ton of pig drops to 1,100-1,300 lbs. Adoption of new techniques, such as the use of coke oven or natural gas in existing furnaces (*CW, April, 23, p. 53*), could tighten the schedule.

Taking these and other factors into account, the Bureau of Mines' James C. O. Harris estimates that the total coke requirement for the U.S. in '75 will be 85.7 million tons —if the ratio of scrap to pig remains at its present level. If it rises to 60% scrap, 40% pig, the total coke requirement will be 96.6 million tons. The lower figure squares well with the projection by Consolidation Coal's George Lamb, who sees a '75 requirement for about 123 million tons of coking coal (*CW, May 14, p. 64*). Using the 70%-yield figure, this amounts to 86.1 million tons. Lamb has looked ahead to '80, which he estimates will show a coke demand of 91 million tons.

When compared with the 82.5 million tons of present coking capacity, it's clear that any significant increase in the production of naphthalene from coal must result from treating available tar more efficiently. The net supply for years to come will not be much bigger than it is now.

How They Stand: There are approximately 31 firms that report naphthalene production, with three accounting for over 87% of the total (*see chart, p. 94*). Koppers is probably the biggest in this respect, with 32-35% of the over-all capacity. Allied, with 30%, is a close second. Allied buys and sells naphthalene, but because of its huge requirements for phthalic, it's a net buyer. U.S. Steel is the third biggest, with 25% of the capacity.

Reilly Tar probably accounts for 3%, Pittsburgh Coke, 2% and Tar Distillers, 1.5%.

PLENTY FROM PETROLEUM

Refiners have long been ready to start pouring out naphthalene. What they needed was some encouragement from the chemical industry. Today, it's as though the chemical industry forgot to say "when." The scorecard:

Ashland is building a 75-million-lbs./year plant at Catlettsburg, Ky. Actually, company engineers are now convinced that this is on the low side, think the plant can turn out 100 million lbs.

Sun is building an $8-million, 100-million-lbs./year plant at its Toledo, O., refinery. It is "looking hard" at a second unit, 125 million lbs./year, at its Marcus Hook, Pa., refinery. No decision has been reached, but management is frankly optimistic.

A joint (unnamed) venture of Tidewater Oil Co. and Collier Carbon and Chemical has contracted for a 100-million-lbs./year plant at Tidewater's Delaware City refinery. The same group is planning a similar plant on the West Coast.

Signal Oil in Houston is now using its Hydeal unit to make benzene, could use it to make 30-50 million lbs./year of naphthalene. Such a switch, however, is at least a year away. Others could purchase refinery materials as feedstocks for their own naphthalene production. Tennessee Products Corp. is reported interested in such an operation. And Monsanto is believed to have a plant on the drawing board to make its own naphthalene for phthalic at its Alvin, Tex., site.

A number of other firms have worked on processes for making petroleum naphthalene. Sinclair is contemplating a 60-million-lbs./year plant at Marcus Hook or Chicago. Its bigger Houston refinery could support a 75-million-lbs./year operation, but that's a less likely site right now.

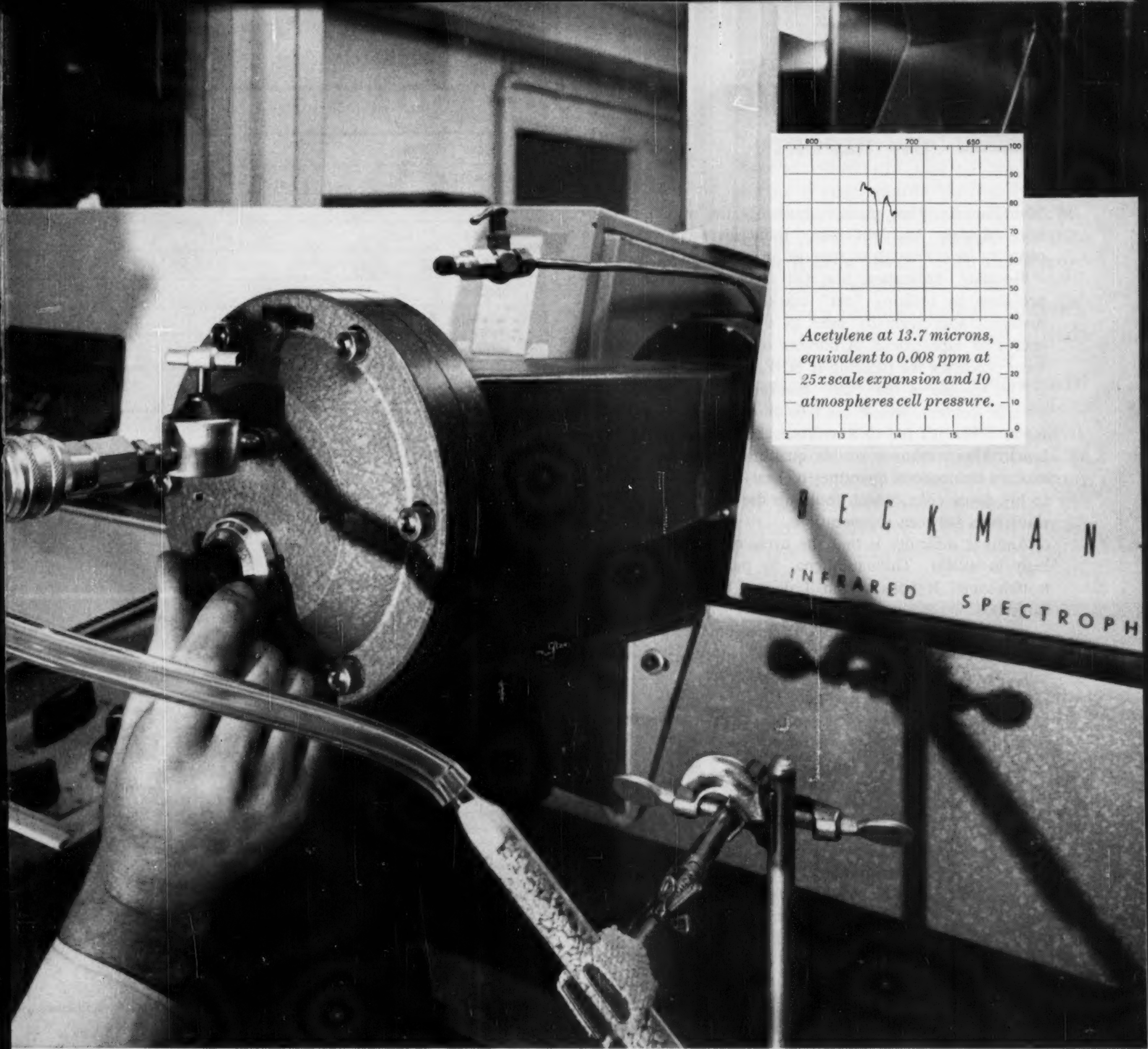
Cycle Oil or Reformate? There are two sources of methylnaphthalenes in a refinery—recycle oil from a catalytic cracker and the bottoms from a catalytic reformer.

Both Ashland and Tidewater-Collier are using the latter while Sun is starting with cycle oil.

Naphthalene precursors in the reformer charge are alkyl cyclohexanes and hydrogenated naphthalenes (tetrahydronaphthalene and decahydronaphthalene). Normally, these compounds go into fuel oil blending stock. That's because, when reformed, they're converted into the high-boiling naphthalenes and alkyl naphthalenes that are undesirable in modern gasoline. (They're the culprits that Gulf, in its advertising campaign, has dubbed "dirty-burning tail-ends.")

Ashland and Tidewater-Collier, however, find them attractive starting materials for naphthalene. After the reformate is fractionated, the bottoms contain considerable naphthalene itself. Although the amount will vary depending upon the crude that's used and the depth of reforming, on a rough average 6% of the reformate feed will be straight naphthalene. This could be crystallized out, in much the same way as naphthalene from coke ovens is. However, both Ashland and Tidewater-Collier will feed the bottoms to a hydrocracking unit, where the methylnaphthalenes will also be converted into naphthalene. Ashland will employ its patented Hydeal process (U.S. 2,951,886). Tidewater-Collier will use a process patented by Union Oil (U.S. 2,734,929). Both have additional patents pending. Union, incidentally, owns about 80% of Collier.

The trouble with this sort of an operation is that a


Acetylene at 13.7 microns,
equivalent to 0.008 ppm at
25x scale expansion and 10
atmospheres cell pressure.
INFRARED
SPECTROPH

50-million-lbs./year plant is probably the minimum economical size. And not many refineries have reforming capacity large enough to support an operation of that size.

Boosting Aromatics: Sun Oil faces a different set of problems in utilizing "cat" cracker recycle stock. This material, also normally used as a heating oil, is a rich source of naphthalene. A number of petroleum companies have processes for utilizing it (*CW, Aug. 25, '56, p. 60*).

The trouble is that "cat" cracker recycle stock has a paraffin content, which can't be removed by Udex treatment. When it's fed to a hydrocracking unit, the paraffins crack. This consumes sizable quantities of hydrogen, also evolves tremendous quantities of heat. In addition, it tends to lay down coke, which fouls up the catalyst, makes for short runs between regenerations.

Another difficulty is that the cycle oil is comparatively high in sulfur. Thionaphthene, in particular, could be troublesome. It boils within 1 degree F of naphthalene, can't be completely removed by hydrogenation.

It's difficult to generalize on the aromatic content of cycle oil, but in most refineries in this country, it probably runs about 40%. The feeling is that for an economic naphthalene operation, it should be 70%.

Sun won't say how it has solved these problems. Its product specifications for sulfur are low (although it reportedly does include a specification for a small quantity of thionaphthene). One possibility is that it extracts the aromatics from cycle oil using sulfur dioxide or furfural.

Price Problem: Petroleum naphthalene will be almost a different compound from the coal-tar material. Ashland, for example, will guarantee a 79.6-degree product, equivalent to fully refined coal-tar naphthalene. But it feels it can actually make an 80-degree material. The other producers will turn out a comparable product.

This means a product purity of over 99%. Crude 78-degree naphthalene, the normal feed to a phthalic plant, on the other hand, contains only 95% naphthalene.

To make matters more confusing, the petroleum material is being sold on a different basis—either f.o.b. or delivered price. Crude naphthalene currently goes for 6¢/lb.—freight equalized.

In any case, Sun will sell its product for 5.7¢/lb. f.o.b. the refinery, Toledo. Ashland's price is thought to be 7.5¢/lb. delivered, while Tidewater-Collier's is 6.5¢/lb. f.o.b. Tidewater-Collier says its price is a firm one, but the other two are escalated. Ashland is tying its price to that of crude naphthalene (although contracts are believed to have a minimum price clause).

Sun has a rather complicated formula in which it weighs the various cost components of its product. A large portion of the price—thought to be more than half—is controlled by the selling price for fuel oil (because it's the raw material for naphthalene) on the Gulf Coast. But other factors such as labor weights are taken into account. Sun's rationale is that it's more interested in getting a reasonable pay-out than in trying to remain competitive with coal-tar naphthalene.

The buyer of crude naphthalene gets a bonus in the

Ortho-Xylene Producers and Capacities

Company	Capacity (million lbs./year) Dec. 1960	Dec. 1961
Cosden Petroleum	12	12
Delhi-Taylor	70*	70*
Humble Oil & Refining	72**	100**
Oronite	30	130
Cities Service	—	105
Sinclair	—	66
Tennessee Oil & Refining	—	23*
Suntide Oil	33	44
Totals	217	550

*Companies do not have reformate capacity for capacity operation but can purchase feedstock.

**Current expansion from 44 to 72 is scheduled for completion this month. Eventual capacity could be 165 million lbs.

Petroleum Naphthalene — How Much and How Soon

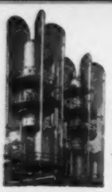
Company	Capacity (million lbs./year)	Site	Source	Price
Ashland	75-100	Catlettsburg, Ky.	Reformate bottoms	7.5¢/lb., delivered, escalated to price of crude naphthalene
Sun	100	Toledo, O.	Cat cracker recycle stock	5.7¢/lb., f.o.b. Toledo. Escalated to production costs
Collier-Tidewater	100	Delaware City, Del.	Reformate bottoms	6.5¢/lb., f.o.b., firm
	100	Los Angeles	"	"

Coke-Oven Naphthalene — Companies and Capacities*

Company	Plant	Combined Capacity (million lbs./year)
Koppers	Follansbee, W.Va. Chicago Fontana, Calif. Kearny, N.J.	190-240
Allied	Frankford, Pa. Ironton, O. Chicago Detroit	180
U.S. Steel	Gary, Ind. Clairton, Pa. Birmingham, Ala.	150
Reilly Tar	Cleveland Fairmount, W.Va. Granite City, Ill.**	18
Pittsburgh Coke	Neville Island, Pa.	12
Tar Distilling Co. (Witco)	Cleveland	9-10
All Others		30-41
Total		600

*CW estimates based on a total industry potential of 600 million lbs./year.

**Refined naphthalene only.



form of freight equalization. This, of course, depends on how close he is to the nearest naphthalene source, and will vary greatly. But the average probably comes to ½¢/lb. Compared with Sun's price, for example, it would then be 0.2¢/lb. cheaper. Refiners contend, however, that their product—because it contains more actual naphthalene—should command a price differential of ¼¢/lb., on a contained naphthalene basis alone.

The difficulty with such reasoning is that a phthalic user may not be able to get any improvement in yield from the purer product, particularly in fixed-bed units. For crude naphthalene contains methylnaphthalenes as impurities. And these, too, are converted into phthalic, although not as efficiently as is naphthalene itself.

What Price Crude? Present comparisons of crude and petroleum naphthalene prices will undoubtedly become academic when petroleum naphthalene becomes available. Refiners are seeking, and getting, long-term contracts for their output. But tar processors have some long-term contracts too. Moreover, they're determined to move their product.

Their naphthalene plants are largely amortized. And they have to handle the tar to get the other products—tar acids and bases, creosote and pitch. The alternative to selling naphthalene is to add it to the creosote, where it would command only a fuel value, possibly 1-2¢/lb. There's no question that they'll slash the prices to keep their naphthalene markets. At least one major producer says it could sell naphthalene for 3½¢/lb. and still make a profit.

By the same token, it's hard to see how naphthalene from coke ovens can hold onto the market for refined material, which now sells for 10¾¢/lb. (There has been some doubt as to whether petroleum naphthalene can make a suitable moth ball: it's so pure and its odor is so mild that there's a question concerning its ability to gain consumer acceptance.) But Ashland, which admits that its material is "quite bland," anticipates no trouble in making it "smell as foul as necessary."

The entire question of marketing naphthalene is crucial to tar processors, refiners and phthalic makers. But it can only be considered in context with the ortho-xylene picture and with the trends in phthalic anhydride processing, particularly with the increasing popularity of fluidized beds.

BOOM IN ORTHO EXPORTS

Few chemicals have been able to match the success posted by ortho-xylene this year. It's all attributable to the big expansion in phthalic production in Europe and Japan.

Germany, France and Belgium, traditional naphthalene exporters, are buying U.S. ortho-xylene. In Japan at least 70% of the phthalic capacity is built on ortho as a feedstock. Italy formerly bought naphthalene from Russia, Czechoslovakia and Poland. But when the Soviet bloc countries started building up phthalic capacity, Italy had to turn to U.S. ortho-xylene. Today, more than 80% of its phthalic capacity utilizes ortho.

How does ortho-xylene compare with naphthalene as a raw material for phthalic? Japanese firms and Italian companies, like Ftalital and BPD (Bombrini Parodi-Delfino) have won respect for the work they've done in adapting ortho to phthalic production.

In this country, Oronite has been making phthalic from ortho-xylene. But its plant has been in operation for 15 years and if the firm were building a plant now it would doubtless be able to put up a more efficient unit. In a small-scale unit Amoco's liquid-phase process worked well, converted mixed xylene into the corresponding phthalic in almost theoretical yield. But the full-scale unit is still running into mechanical difficulties.

Scientific Design has developed a catalyst for phthalic that, it says, works at normal efficiencies on naphthalene, "exceptionally high" on ortho-xylene.

And theoretically, ortho-xylene should turn out more phthalic per pound than napthalene because one of the naphthalene rings gets chewed up: a pound of ortho-xylene should produce 1.39 lbs. of phthalic and use only 0.9 lb. of oxygen, while a pound of naphthalene should produce only 1.16 lbs. of phthalic and should require 1.12 lbs. of oxygen.

In practice, however, reported yields from ortho have been appreciably lower. The industry practice is to report yields of phthalic per pound of incoming feed (not per pound of contained naphthalene or ortho). The general ranges: when using ortho-xylene, 0.65-0.75; when using naphthalene in a fixed bed, 0.75-0.83. Cyanamid's fluid-bed unit reportedly gets as high as 0.95.

Plants designed to utilize naphthalene can—and occasionally do—employ ortho-xylene. But, in addition to lower yields, such plants show a drop in throughput of 20% or more when using the substitute material.

Still, the consensus is that there's nothing wrong with using ortho-xylene that the proper catalyst will not cure. A number of refiners are firmly convinced that ortho-xylene is destined to become a really significant raw material for phthalic in the U.S. Scientific Design is bullish on ortho and feels that it has already found the right catalyst to do the job.

Some point out that 95% ortho-xylene is of relatively recent vintage, feel that phthalic users may be overlooking ortho because of unhappy experiences with a cruder product. Cosden says it can upgrade ortho to 99% purity for less than 0.5¢/lb.

They argue further that oxidation of naphthalene has been investigated by a number of organizations for more than 40 years, while only Oronite has had any really extensive studies on ortho-xylene for a long time. They conclude it's reasonable to expect more improvements in the future with ortho-xylene oxidations.

Also, they point to the tremendous quantities of xylenes that are turned out by reformers in the U.S. and that ortho can be removed from the aromatic stream by simple distillation.

One big booster of ortho is Fred Fallek, president of Fallek Chemical (New York City). Long identified with

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phthalic and naphthalene, Fallek has become a big exporter of ortho-xylene and, in fact, played a key role in encouraging the overseas migration of the product. He reports that some overseas firms are approaching yields from ortho-xylene that compare favorably with naphthalene. He thinks it's only a matter of time before there's a big swing to ortho in this country. And, as far as overseas shipments are concerned, he thinks ortho has a decided edge over petroleum naphthalene, at least. This is how he reasons:

To the basic cost of naphthalene at the refinery in this country must be added costs of flaking, bagging and shipping to the port.

A reported quote to a foreign phthalic maker for petroleum naphthalene in bags was approximately 7.2¢/lb., f.o.b. U.S. shipping port. At least 1¢/lb. more would be needed for shipping the bagged product overseas.

On the other hand, ortho-xylene (95%) sells, under long-term contract, for as low as 35¢/gal. f.o.b. a Gulf Coast port. That's 4¾¢/lb. Since it's a liquid, ocean transport would be only ½¢/lb., bringing the price at the port in Europe to 5¼¢/lb. That's a difference to the user of almost 3¢/lb. at his port.

Petroleum naphthalene people don't go along with that reasoning, however. Tidewater-Collier, for instance, says it expects to ship naphthalene to Japan and is building insulated tankers to carry it in the molten state. Sun reports it has been deluged with requests for naphthalene from foreign customers. If it builds its plant at Marcus Hook, it will probably export some to Europe. But it feels that it will have to justify its expediture on a domestic market for the product.

And, in truth, it's hard to arouse any real enthusiasm for ortho-xylene as a raw material among U.S. manufacturers of phthalic (saving Oronite and Amoco, of course). They buy it now when naphthalene is short. But most of the material is committed to overseas markets under long-term contracts. Spot sales go for about 6¢/lb. They could get favorable terms if they were willing to make long-term contracts too.

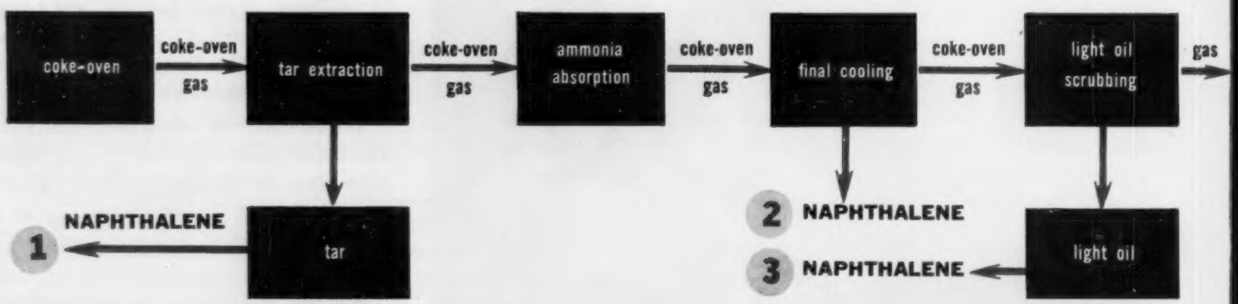
But the lower price of ortho (compared with naphthalene) is just about cancelled out by the lower yield. The possibility of getting a yield closer to theoretical is an incentive for more development work on xylene oxidation processes.

To date, however, technical progress hasn't been sufficient to cause any significant trend away from naphthalene. If the petroleum naphthalene plants perform as expected, it's difficult to see any big swing to ortho, particularly in view of the coming surplus of phthalic capacity.

FIXED OR FLUID BEDS

Most of the existing phthalic capacity in this country consists of fixed-bed plants that oxidize naphthalene. But fluidized units have become increasingly popular. A quick

DIMENSION



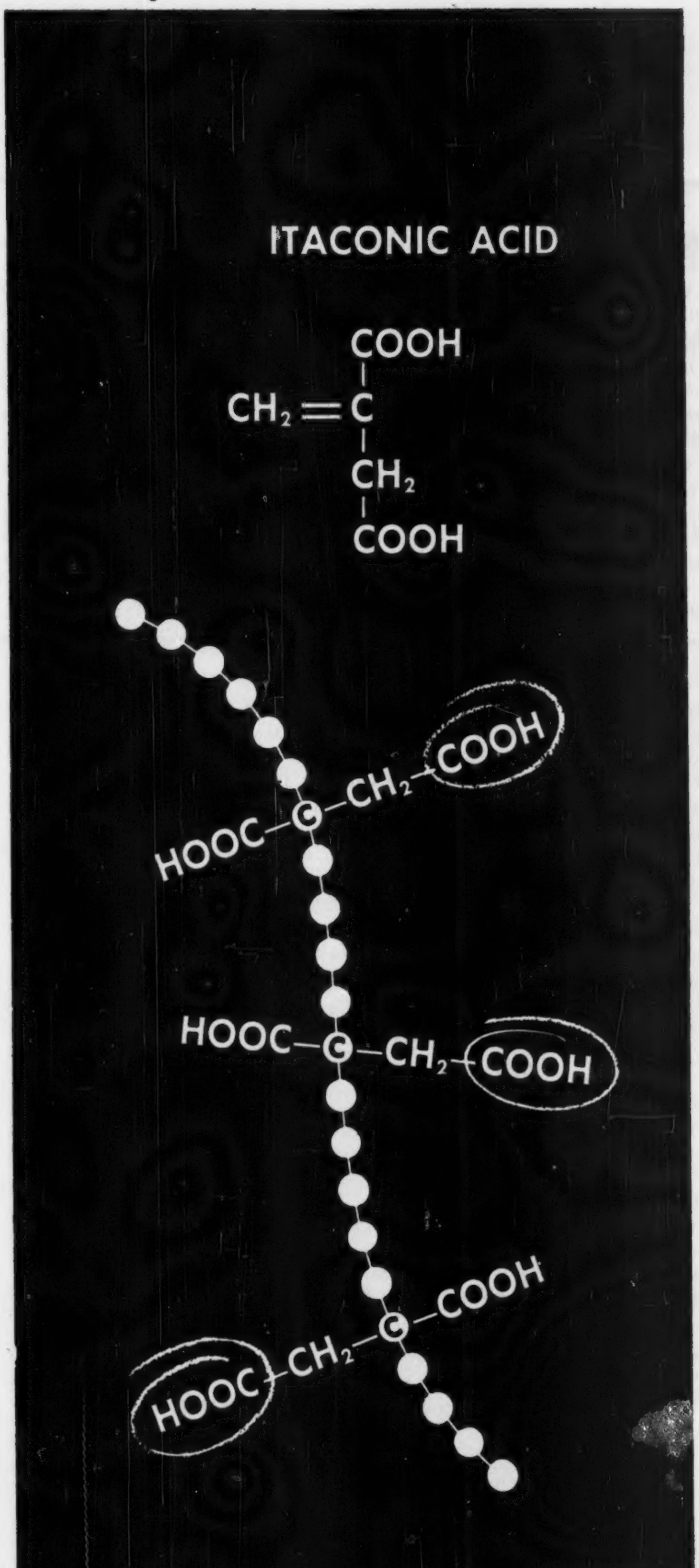
The Three Sources of Coke-Oven Naphthalene

As shown above, naphthalene is recovered in three different parts in the processing of coke-oven by-products: from coal tar, from the final cooling of coke-oven gas (before light oil removal) and from the residue of the light oil distillation.

Tar, however, is the principal source. Normally it's fractionated into: middle oil (200-250 C), creosote (250-300 C) and pitch (the residue). Naphthalene makes up about 10% of the total tar, is taken off in the middle oil fraction (after the tar acids and bases are removed). Some coke-oven operators simply "top" the tar by taking off a fraction boiling under 300 C. This (so-called chemical oil) is then sold to tar processors for separation into chemicals. The residue from topping is used as fuel.

Purity of naphthalene is measured by its melting point. Pure naphthalene melts at 80.2 C. Refined naphthalene melts at 79.6 C.

Naphthalene in the residue from light oil and final-cooler naphthalene are lower-grade materials that can be boosted to either "crude" naphthalene (78 C) or refined naphthalene.



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The Trouble With Using Ortho-Xylene

One big objection to using ortho-xylene, in the past at least, is that the actual amount of phthalic produced per pound of feed was approximately 0.1 lb. less than when naphthalene was the feed. Even with equal weight yields, however, molar yields from ortho-xylene are appreciably less—because when oxidizing naphthalene to phthalic, two carbon atoms are converted into carbon dioxide.

That means a heat removal problem. Here's why:

Assume that 1 lb. of pure ortho and 1 lb. of pure naphthalene each produce 0.83 lbs. of phthalic. That's a molar yield for naphthalene of 71.5%; for ortho-xylene, 59.8%. It means that a larger portion of the ortho-xylene is being degraded (mainly to carbon dioxide) and that, in turn, means more heat is evolved. Thus, plants designed to operate only on naphthalene can't get rid of the heat fast enough and must slow down the operation.

Scientific Design, which offers a flexible catalyst, circumvents this by putting in extra capacity for heat removal. This, it says, adds only slightly to the capital cost of the plant.

Nobody quite understands why higher molar yields have not been attained with ortho-xylene (although several theories have so far been advanced).

The problem of accommodating ortho-xylene to a fluid bed presents problems of a different order. Several people have tried. None has been successful, so far.

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look at the various types of processes now in use:

Fixed-bed plants using naphthalene. Naphthalene is melted, vaporized by air and introduced into the reactor system with more air. The reactor consists of thousands of small tubes containing vanadium pentoxide catalyst. Excess air is used to avoid operating within the explosive limits. Approximately 20-22 lbs. of air are used for each pound of naphthalene. The reaction is exothermic and heat is removed by pumping molten salt across the bank of tubes. Mercury is also used to remove heat, but because it's so expensive it's practical only in a small plant.

The product is sent through a condenser where it's crystallized. The product contains approximately 5% maleic anhydride (which can be removed by additional processing) and small amounts of naphthoquinone.

Fixed bed using ortho-xylene. Oronite's process for making phthalic from ortho-xylene is similar to naphthalene processes (*CW, April 6, '57, p. 35*). One difference: use of low-surface catalyst support, instead of high-surface supports—e.g., silica gel.

Liquid phase ortho-xylene. Amoco's plant employs a liquid-phase oxidation, is designed to oxidize mixed xylenes to the corresponding phthalic form. Key: use of a heavy metal catalyst in conjunction with bromine (*CW, March 6, '57, p. 37*).

Fluid-bed processes using naphthalene. In fluid-bed plants, vanadium pentoxide is also used as catalyst but is finely powdered (50-60 microns). A single reactor replaces the multiple tubes. There are at least three versions of the fluidized process: Sherwin-Williams' (*CW, Feb. 23, '52, p. 40*); England's United Coke and Chemicals' (*CW, Feb. 16, '57, p. 112*); and American Cyanamid's (*CW, July 18, '59, p. 37*).

What's the Difference? The principal process competition at the moment in this country is between fixed- and fluid-bed plants using naphthalene. Scientific Design is building fixed-bed plants, Badger is building fluid-bed units using the Sherwin-Williams process.

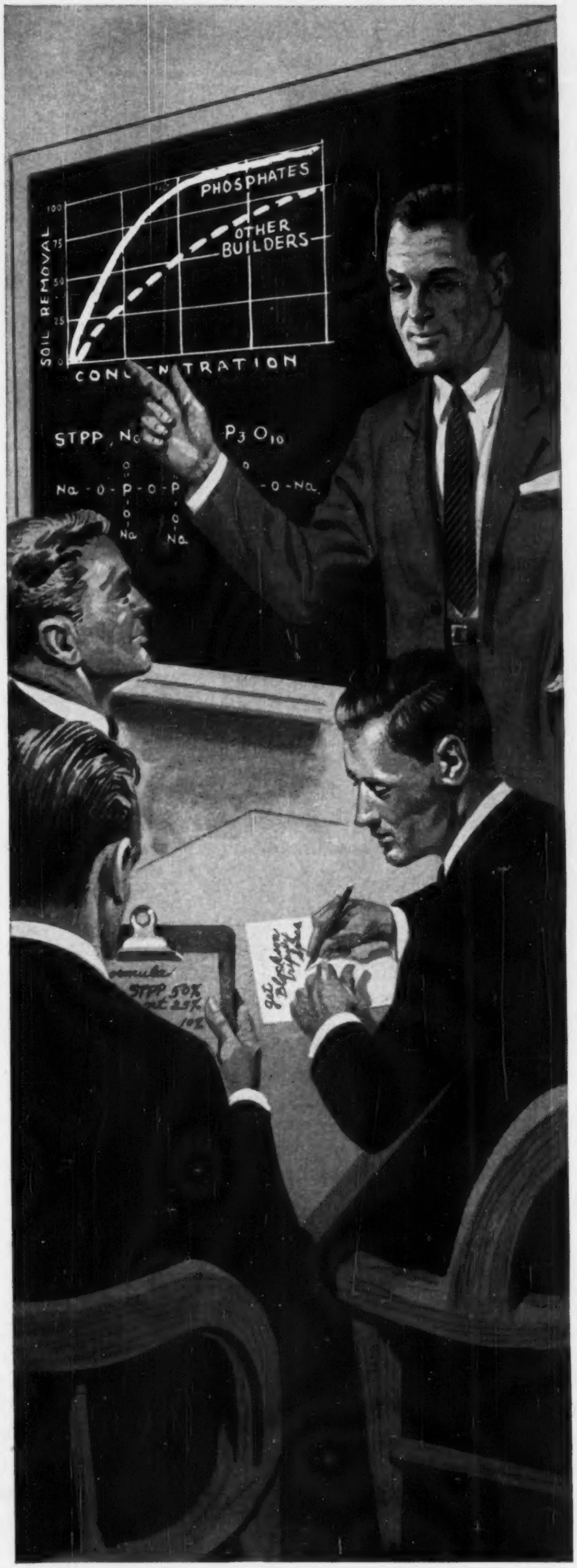
Foster Wheeler is offering the United Coke and Chemical's fluid-bed plants as well as a fixed-bed process. Kellogg designed and built the American Cyanamid plant and built a fluid unit for ICI, but ICI is not believed to be actively bidding for new jobs in this field. Ralph M Parsons Co. built Koppers' plant and is believed to be seeking other jobs. It says merely that its present development work is not far enough advanced to permit any statement on it.

Proponents of both fixed- and fluid-bed processes can marshal some strong arguments. For example, this is how Badger engineers state the case for fluidized processes:

> The economics of processing phthalic are a function of the air needed. Because contact time is longer and the temperature is lower in a fluidized bed, it's possible to get by with only 10-12 lbs. of air/pound of naphthalene—a little more than half the amount needed in fixed-bed units. This means reduced utility requirements, smaller equipment size. And because the concentration of product is higher in the gases, it can be condensed out as a liquid. Also, yields are higher and temperature control is better.
>
> The operation is safer because hot spots are avoided and the fluidized catalyst "stone dusts" the reaction. The ability to withdraw catalyst and cool it off side-steps the need for a salt system. Labor requirements are reduced (two fewer operators for a 20-million-lbs./year plant). And, finally, by-product formation is reduced. About the same amount of naphthoquinone is formed, but the maleic anhydride is reduced by "an order of magnitude."

Engineers at Scientific Design concede some advantages inherent in fluidized units, but state that that's only part of the story. Here's what they say:

> Fluidized reactors are bigger, more expensive, particularly if catalyst filters and other auxiliary equipment are added. Pressure drops are higher, so utility requirements are about the same as for a fixed-bed operation. Catalyst losses are appreciable due to attrition, while they're practically nonexistent in a fixed bed. Fluid processing presents some formidable mechanical problems and plants are difficult to start up. Any



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Comparing economics of the two processes is a complex study, requiring a detailed analysis of a number of variables for each case. Fixed-bed units will have a slight edge except when very large (40 million lbs./year or more) single reactors are built. And, so far, only Cyanamid has built a single reactor that big.

More important is the question of raw materials. It's impossible to predict the long-range supply-price relationships of phthalic raw materials. The SD catalyst can operate successfully with either naphthalene or xylene, while no one has yet successfully designed a fluid plant to work on ortho-xylene. Conclusion: an SD plant affords flexibility that may tilt the balance for the long pull.

In the middle of such an argument is Foster Wheeler. Its conclusion: for smaller-size units, it will recommend fixed-bed units, probably when mercury cooling is practical. For larger plants, it will probably suggest fluidized processing. Its definition of "large" plants, however, is only a fraction of SD's.

That all the arguments are weighty is evidenced by recent decisions: three (Reichhold, Hatco, Monsanto) have chosen Badger fluid beds for their new plants, while Witco (Scientific Design) and Thompson (Foster Wheeler) are building fixed-bed plants.

Sulfur Limits: Fixed-bed boosters also point out that any increase in yields or other factors theoretically attainable must be weighed against the increased cost of raw materials. That's because, they say, the naphthalene feed to a phthalic plant must be low in sulfur.

Cyanamid has found that its feed must have a sulfur content less than 0.05%. It treats the naphthalene with sodium to bring the sulfur down to the proper level.

Koppers is building a hydrogenation plant to remove sulfur. But hydrogenation has to be done carefully otherwise it converts the naphthalene into tetrahydro- (or even decahydro-) naphthalene.

The capital costs for sodium treatment are negligible, but the operating costs come to approximately 1.5¢/lb. Hydrogenation, on the other hand, involves a higher capital investment but a lower operating cost, probably less than 1¢/lb.

In any case, Badger says that its process does not require any special treatment to cut sulfur. It reports that it can tolerate (and has operated successfully with) a sulfur content as high as 0.9%, a requirement readily met by any normal naphthalene crude.

By the same token, it seems clear that fluid beds can show off high-purity naphthalene to its best advantage in phthalic manufacture.

The Germans, who did the early work on the catalyst used in the original fluid-bed process (vanadium pentoxide, poisoned with potassium sulfate on an activating support), had reported yields of 1.05 to 1.10 lbs. of phthalic/pound of naphthalene feed. But it has been suspected that they were charging refined naphthalene. With coal-tar material, that would be unthinkable in this country.

But that's where petroleum naphthalene comes in. With its high purity and low sulfur content, it's conceivable that it will appreciably enhance fluidized-bed yields. Ashland reports indications that its products will permit yields of 1.04 lbs. of phthalic/pound of naphthalene.

The truth is, however, that nobody can be sure of what petroleum naphthalene can do, in either fluid or fixed beds, until there's enough available to make a number of runs in large-scale equipment. One producer is now preparing to make a run with low-sulfur naphthalene in a fixed-bed installation. But even that, when completed, will provide only a partial answer.

Moreover, when petroleum naphthalene does become freely available, the price of coke-oven material is likely to drop quickly. Producers will then have a new set of prices that they'll have to weigh against any possible increase in yields.

Problems and Prospects: Some of the questions concerning the future of phthalic and its raw materials can't be answered at the moment. But it is possible to reach some broad conclusions.

For instance, it's clear that there will be more than enough phthalic capacity to meet demands for the foreseeable future. *CW* estimates of demand are optimistic. There could be some attrition on projected capacity, but that will be compensated for by inroads that are made by isophthalic.

Phthalic price has traditionally been about 13¢/lb. above naphthalene's. With a lower price for naphthalene in the offing and improved processing efficiencies, it's likely that phthalic's price will trend downward. That, plus the assurance of supply, should encourage other uses to broaden the market.

Materials Supply: Petroleum naphthalene fills a long-felt need. At first glance, it would seem that the refiners may have been overzealous. But that depends on the foreign market. If the new plants operate as expected, the U.S. may soon become a net exporter of naphthalene. But there it will run into competition with ortho-xylene and increased supplies of naphthalene sources overseas due to increased industrialization. (Germany has plans now for its own petroleum naphthalene plant.)

Long-range prospects of coke-oven and petroleum naphthalene depend on price and efficiencies. It's not probable that petroleum product can meet coke-oven naphthalene's price for some time. If it gives superior performance, tar processors may have to take steps to hike purity. If not, some refiners may convert to making benzene from toluene when their naphthalene contracts run out.

What's important is that phthalic and naphthalene have had a feast-or-famine history. The present temporary famine is about to turn into a long-term feast.

Copies of this report will be available at $1 each from CW Reprint Dept.

U. of Pittsburgh's Klaus Hofmann (right) paced ACTH synthesis.

New Hormone Conquest

The first successful synthesis of ACTH (adrenocorticotropic hormone) was revealed last week by a team of University of Pittsburgh researchers. This new synthetic has the full biological activity of natural ACTH, represents the largest proteinlike molecule ever produced in a lab.

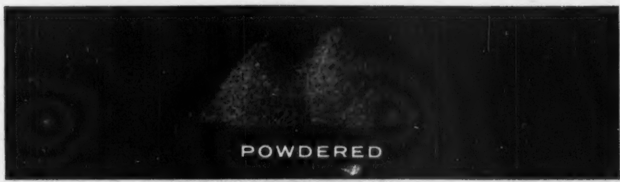
Klaus Hofmann, chairman of the biochemistry department in Pitt's School of Medicine, directed the work. His group assembled 23 natural amino acids (constituents of proteins) in preparing ACTH, paving the way to synthesis of even more complex compounds of this type.

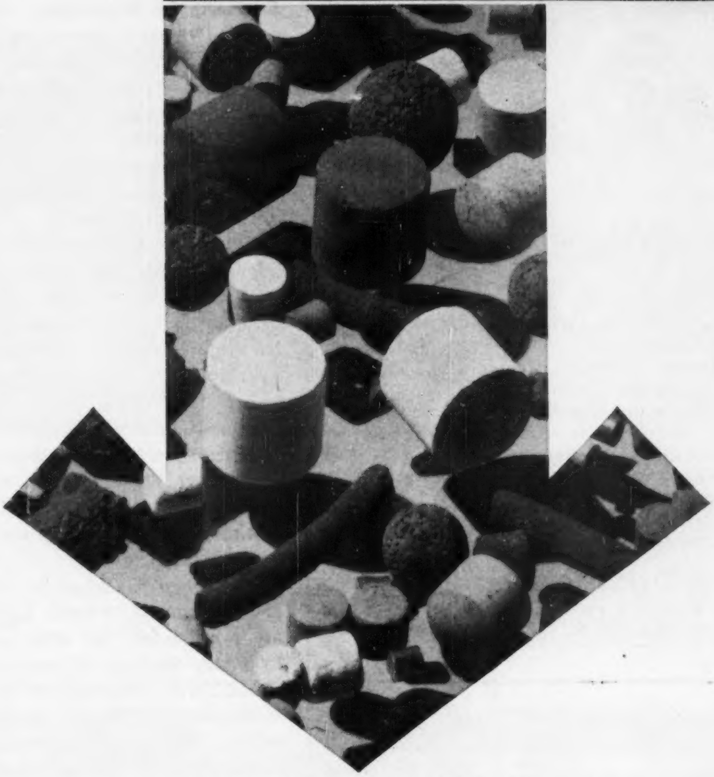
The synthesis involved joining amino acids (e.g., serine, tyrosine, methionine, etc.) in their proper sequence in a straight chain, blocking every point of possible reaction except the desired one, then unblocking these sites to reproduce the natural molecule. The end result is equivalent to the hormone produced by the pituitary gland, the body's so-called "master gland." This hormone causes the cortex of the adrenal gland to release cortisone and other steroids into the system.

Stepping Stone: What the full significance of the achievement will be is difficult to predict. Hofmann believes it will have fourfold significance: it will help clarify the functions of the pituitary gland; it will allow investigators to work with pure ACTH; it gives clues to the understanding of how the pituitary gland stimulates production of important steroid hormones. In addition, new synthesis techniques developed by Hofmann and his team can be used to modify the natural structure of ACTH in efforts to discover medically useful compounds.

Research budget for the ACTH project is currently $80,000/year. Supporters of the team's work include the National Institute of Arthritis and Metabolic Diseases, the National Science Foundation, the American Cancer Society, and Armour & Co.

ACTH research dates back to 1943, includes milestones such as the isolation of the 39-unit amino acid structure by P. Bell of the Lederle Laboratories division of American Cyanamid in '54 (*CW, Nov. 20, '54, p. 86*), and synthesis of a 19-unit ACTH portion by C. H. Li and coworkers at the University of California School of Medicine, in San Francisco (*CW Technology Newsletter, Dec. 3*).





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Posting R&D Gains

This week's 53rd annual meeting of the American Institute of Chemical Engineers in Washington, D.C., assembled research experts on subjects ranging from air pollution to zinc alloys. Some gains highlighted on the program: progress in purifying auto exhaust, appraisal of the outlook for fuel cells; new details on Koppers Co.'s novel process to convert saline water into potable water.

Chromites and chromium-containing iron oxides help remove nitrogen oxides, carbon monoxide and hydrocarbons from auto exhaust, according to Francis Taylor of Philadelphia's Franklin Institute. Using chromites, and by controlling the oxygen concentration in exhaust streams, it has been possible "to achieve simultaneously over 80% removal of nitric oxide and over 80% removal of carbon monoxide and hydrocarbons," he says.

More than 50 industrial, university and government research laboratories are working on fuel cells, according to Sidney Magram, of the Army Research Office (Washington). Hydrogen is the fuel and oxygen or air is the oxidant for the most successful fuel cell to date, he says. But even hydrogen has its limitations for this purpose in the opinion of George Evans, Union Carbide Products (Parma, O.).

Evans' criteria for a good fuel cell are: high rate of energy density available electrochemically per unit of weight or volume of fuel; safe and convenient handling and transportation; capability of delivering power at a high rate; stability under normal environmental conditions and noncorrosiveness to fuel cell components; and low cost. The energy content of hydrogen per unit volume is "relatively low" because of the low density of hydrogen whether in aqueous or gaseous state.

Also, if hydrogen is shipped any distance, "the cost of shipping heavy pressure cylinders becomes larger than the cost of the contained hydrogen." Cryogenics may offer major savings in weight and volume of liquid hydrogen, Evans says. Or hydrogen may be produced at or near where it is to be utilized, either from metals and water or from metal hydrides.

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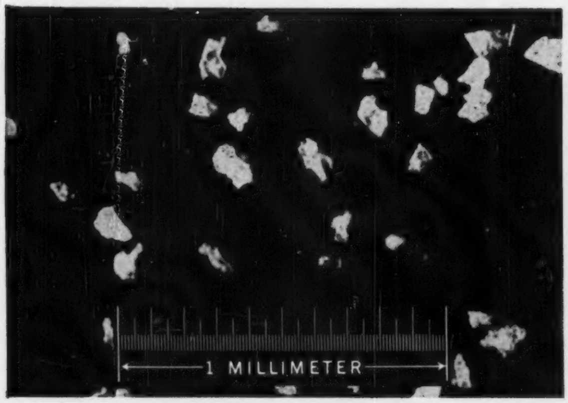

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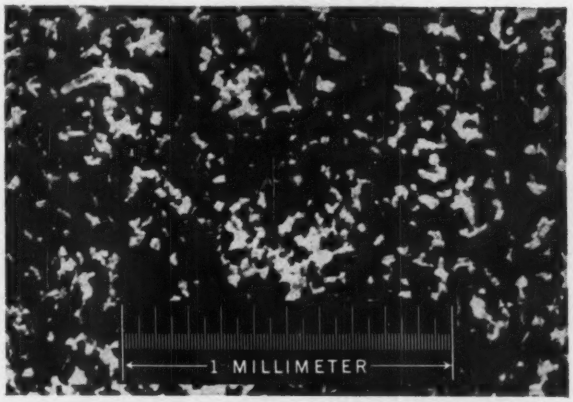
170 Mesh	20.0%	400 Mesh	80.0%



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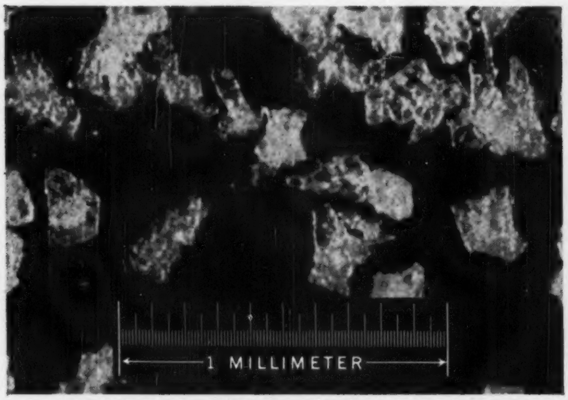

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100 Mesh	.5%	325 Mesh	70.0%
170 Mesh	20.0%	400 Mesh	80.0%

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propane, kerosene, gasoline, fuel oil and other hydrocarbon mixtures—but not coke or coal, "since no one has demonstrated a practical fuel cell employing such fuels."

Koppers believes its saline-water conversion process (*CW Technology Newsletter, July 16*) is the only chemical process being commercially developed for making potable water. Moreover, Koppers spokesmen say, the process "will produce water competitively with any process currently envisioned."

Some details: propane and water are combined to form insoluble clathrate crystals having an approximate composition of 17 moles of water for every mole of propane. The crystals are separated from the mother liquor, washed, and then decomposed to form immiscible layers of salt-free water and propane.

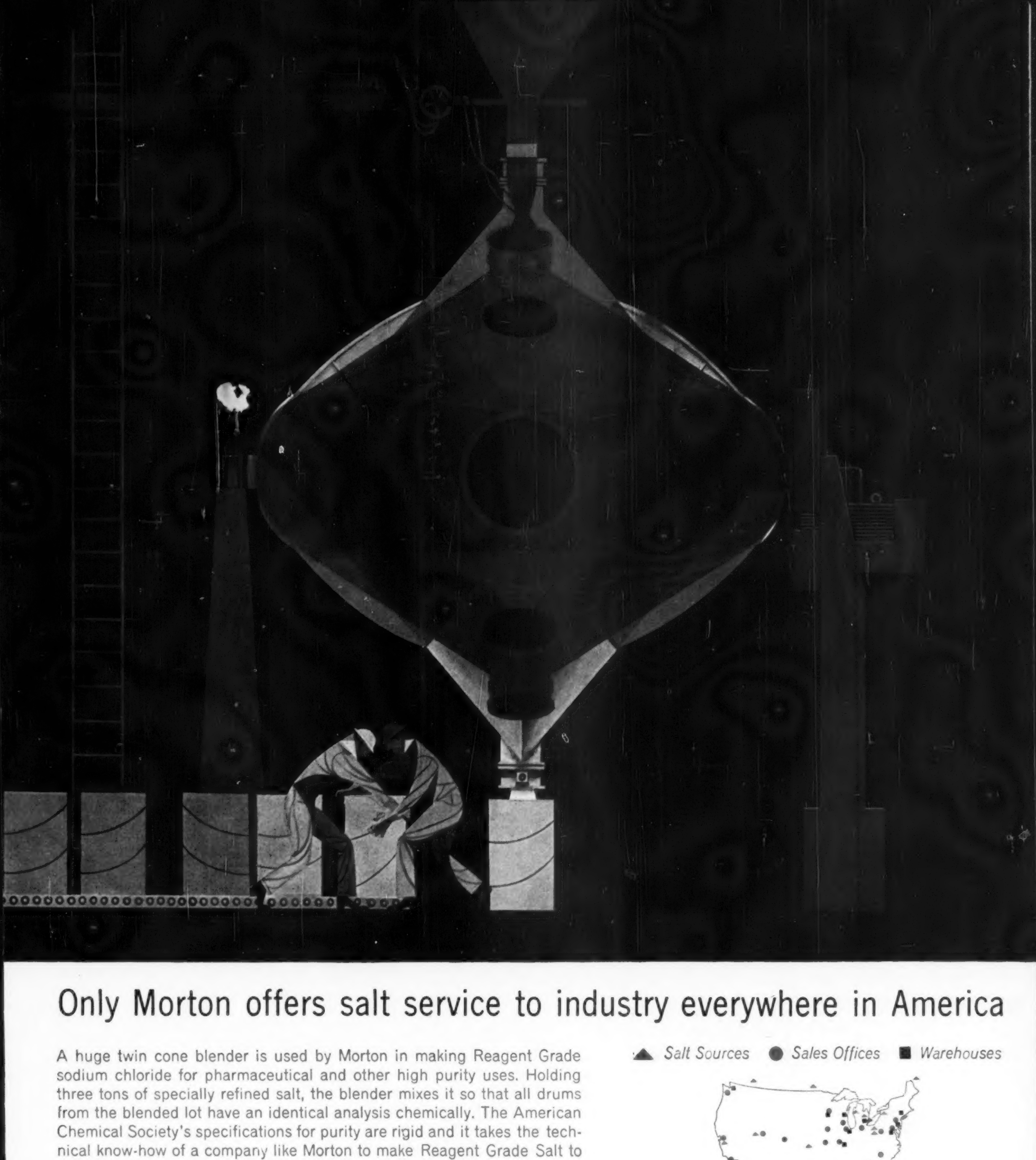
Estimates indicate that the propane hydrate process can produce potable water commercially at less than 50¢/1,000 gal. in a 10-million-gal./-day plant.

New Virus Fighters

Three groups of substances that inhibit virus growth without damaging host cells are now being probed as possible forerunners of useful antiviral drugs. Such progress in antiviral research was described this week by Associate Professor Igor Tamm of the Rockefeller Institute (New York).

A participant in the Medical Science Lecture Series of the University of North Carolina (Chapel Hill), Tamm reports these substances as having "significant selectivity": (1) a synthetic compound, the hydroxybenzyl derivative of benzimidazole (called HBB), used with "marked success" at the Rockefeller Institute and elsewhere; (2) a nucleoprotein known as helenine, derived from mould; (3) substances induced in cells by virus action, which are known as "interferons," proteinlike substances.

Tamm says each of these agents protects cells in the test tube against viral damage and possesses some activity against animal virus infections, an effect that appears to result from inhibition of virus multiplication in the presence of these agents. HBB's activity is limited to polio, Coxsackie and ECHO viruses. Interferons have broader activity, helenine less.



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Market
Newsletter

CHEMICAL WEEK
December 10, 1960

Prices of phthalic anhydride remain uncertain this week. Despite the posting of higher prices by Allied last week, other producers are still marking time, have not made up their minds on whether to follow. Reason for their delay: see *CW's* report on the entire naphthalene, phthalic anhydride situation for the next few years, beginning on p. 85.

•

Two sulfur mines will start to shut down this week. Jefferson Lake Sulphur Co. has notified its employees that it will gradually cut back operations at Clemens Dome (south of Brazoria, Tex.) and at Starks, La. By the first of the year about 50 persons at each plant will be affected. No date for complete shutdown has been given.

According to Harvey A. Wilson, vice-president of Clemens operations, both plants are now uneconomical because of the limited amount of sulfur produced, compared with the cost of hot water, gas, labor and material required to bring the mineral to the surface. Wilson added that two new sulfur wells are under development at each of the above locations. If these should prove productive it might delay the final closing.

No change in operations of Jefferson Lake's mine at Longpoint (in Fort Bend County, Texas) has been reported.

Meanwhile a new sulfur operation is under way at New Orleans, La. Freeport Sulphur Co. reports its sulfur mine at Lake Pelto is in production. To mine the deposit, which is on the marshland shore of the Gulf, Freeport will use its barge-mounted plant, originally employed at the now-depleted Bay Ste. Elaine deposit.

•

Chlorine for Stauffer-Du Pont's Mexican fluorocarbon operations will be supplied from Pennsalt's chlorine-caustic unit near Mexico City. Through its Mexican affiliates, Stauffer, with the aid of Mexican investments and Du Pont capital, will build a carbon tetrachloride plant (outlet for chlorine), plus a fluorinated hydrocarbon unit, near Santa Clara (*see p. 27*).

•

Construction of an ethyl chloride-ethylene dichloride unit has been completed at Sarnia, Ont., by Canadian Badger Co. Ltd. for Ethyl Corp. of Canada Ltd. Ethyl is now undergoing shakedown operations on the new unit, is turning out some material. Supplies of ethylene, hydrogen chloride and chlorine raw materials for the process will be purchased from sources in the Sarnia area.

•

Sales of British-made plastics are starting to taper off. A report from the UK's Board of Trade puts plastics sales for third-quarter '60 at 127,800 tons, compared with 143,000 tons in the second quarter, 146,000 tons in the first. Plastic sales are running ahead of the '59 rate, but at a

steadily diminishing pace. During the first three months, demand was up 29% over the same period in '59. In the second quarter the increase was only 12% over the same period in '59, while '60's third quarter sales were only 6% higher.

•

Prices of nonionic surfactants decreased this week as Jefferson Chemical cut tabs on its line of Surfonic N-series nonionics. New quotes in tank-car quantities: Eastern Zone, 20¢/lb., a reduction of 2½¢/lb.; carloads 23½¢/lb.; l.c.l. 25½¢/lb. Western Zone quotes will be 1¢/lb. higher. All prices are f.o.b. shipping point, freight equalized. Producers of these products indicate that the new prices will become industry-wide.

•

Price of several types of Mylar polyester film has been reduced—the sixth price cut since the start of commercial production in '54. Type C 25- and 35-gauge films were slashed 25¢/lb., with 75-gauge material down 15¢/lb. Primary use for the latter grade: as a dielectric in capacitors. Type A film in 50-gauge was cut 20¢/lb., with 300, 500, 750 and 1,000 gauges 25¢/lb. lower. These reductions bring the price of Mylar down to the $1.55-3.65/lb. range. Reason for the move: greater economy through increased volume.

Du Pont's second Mylar polyester film unit is nearing completion, should be onstream in the spring of '61. The new, $20-million plant, at Florence, S.C., will double capacity of Du Pont's polyester film operations. The first unit was built at Circleville, O., in '54 and has been expanded twice.

•

Industrial trading stamps landed in the chemical process industries this week. A New Jersey trichloroethylene distributor, Circo Corp. (Rahway, N. J.), unveiled its plan to give S&H Green Stamps to buyers of the firm's solvents (trichloro- and perchloroethylene as well as metal cleaning equipment). Basis: ten stamps per dollar of purchases.

Just two months ago (*CW, Oct. 15, p. 28*) a Chicago firm, Industrial Gift Stamp Co., disclosed a somewhat similar plan, though not with S&H stamps. At that time there was talk that certain CPI firms might begin giving the stamps to buyers.

Early reaction from most CPI sales managers and purchasing men indicates little enthusiasm for the plan.

SELECTED PRICE CHANGES—WEEK ENDING DECEMBER 5, 1960

	Change	New Price
Quinine, N.F., 1,000-oz. dms., oz.	$0.0645	$0.3750
Soybean meal, 44% bulk, ton	4.50	47.50
DOWN		
Coconut oil, crude, tanks, N.Y.	$0.0025	$0.14
Corn oil, crude, tanks, works	.0025	.1375

All prices per pound unless quantity is quoted.

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	max. 0.821
Acidity as Acetic Acid (Wt. Per Cent)	max. .001
Color (Pt —Co)	max. 10
Water (Wt. Per Cent)	max. 0.10
Carbonyl Number (Mg KOH/g)	max. 0.2
Distillation: ° C.	
Initial	min. 149
Dry Point	max. 158
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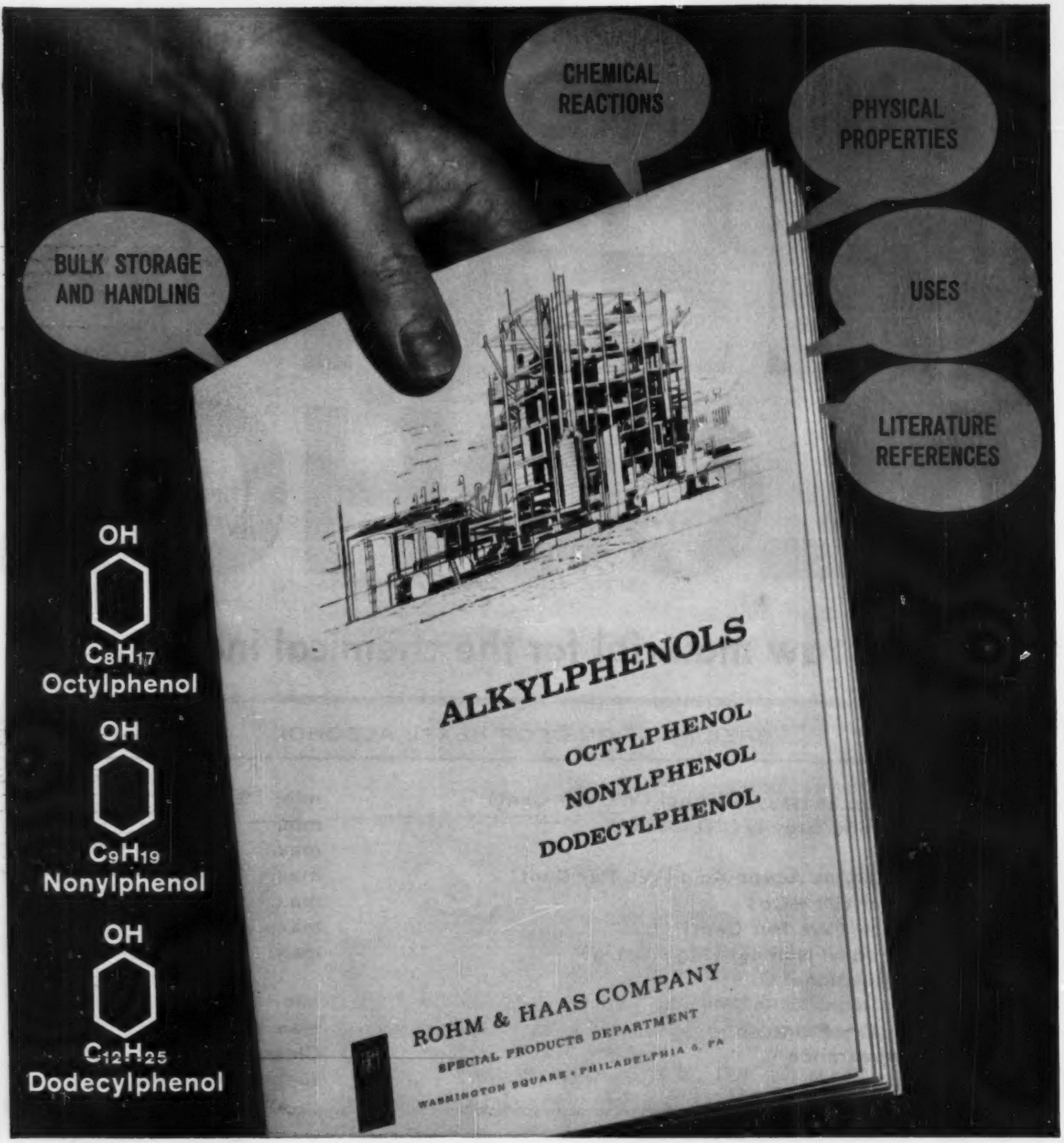

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Chemicals for Industry

ROHM & HAAS COMPANY

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Chemical Raw Material:
Pine logs move toward conversion into paper and rosin products.

'61: Naval Stores' Year of Decision

For the U.S. rosin industry, the next 12-18 months will be among the most critical in its long history. Two big, related problems loom: how to stabilize prices, and how to increase supplies to meet the growing world demand. The way these problems are solved could well determine the fate of this 1-billion-lbs./year industry.

One approach to these posers was unveiled this week by Hercules Powder Co. and Varn Timber Co. (Hoboken, Ga.). They set up Pine Gum Production Corp. to produce commercial pine gum (one of the three sources of rosin) and to promote a research and development program designed to increase production. (Results would be made available to other gum producers.)

Hercules and Varn figure that improving production methods is the key to increased supplies of rosin at prices attractive to both producers and consumers. For Hercules, incidentally, this move makes it a producer of all three rosins: gum, wood and tall oil. (Gum rosin is obtained by tapping pine trees; wood rosin, from wood stumps; tall oil, from fractionation of crude tall oil, a by-product of the sulfate pulping operations.)

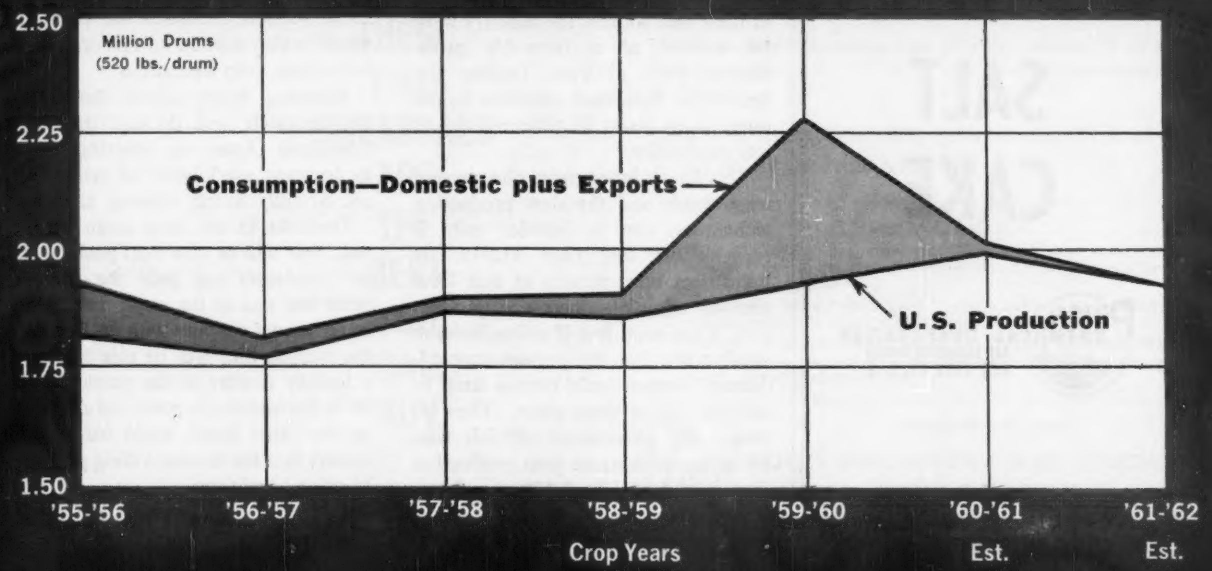
But the Pine Gum enterprise cannot immediately ease rosin's current worldwide supply/demand situation, which is teetering on a delicate balance. Contributing to this tight situation are several major factors: (1) worldwide industrial activity is increasing and is boosting rosin demand; (2) U.S. consumption, moving up gradually over the past four years, jumped 11% during the '59-'60 season, to 1.53 million drums (the highest consumption since the '50-'51 crop year); (3) U.S. supplies are steadily dwindling, as the combined domestic-export consumption continues to outpace production (*see chart*); (4) supplies of Chinese rosin have dropped.

Actually, U.S. producers can supply this country's needs, although demand from the rest of the world has been siphoning off huge quantities of U.S.-made material. During the past crop year, 782,010 drums were exported.

In the '60-'61 season, U.S. rosin production will be up slightly, with total use down slightly from last year's level. According to H. L. Meyer of Chematar Pine Products Corp., production in the current crop year will total about 1.99 million drums, up about 75,000 drums over last year's output. Meanwhile, domestic consumption is expected to drop to 1.44 million drums, a decrease of 91,000 drums. Exports will also be off, about 136,000 drums (it will total 646,000 drums). Net result will be that 96,000-100,000 drums will be drawn from inventory.

Price Troubles: Rising prices, too,

Rosin Consumption Drops as Production Lags



will affect the future of rosin. Starting in '59 and continuing through '61 the rosin industry faced a period of runaway prices.

Demands for rosin from both domestic and foreign consumers put heavy drains on existing supplies. This condition drove prices steadily upward, from $8/100 lbs. (a level that had prevailed throughout most of the '50s) to $17-18/100 lbs. for gum, $15/-100 lbs. for wood, $14/100 lbs. for tall oil. These prices are still being quoted, although wood and tall oil producers have tried to maintain somewhat lower ones.

While high prices may seem attractive, they have disturbed most producers. If the industry is unable to hold the present price line, consumers will continue to turn to substitutes. This is another factor in the decline in U.S. consumption.

In addition, the lure of higher prices could precipitate a big increase in gum rosin output during the next few years that could lead to overproduction, push the bottom out of the market. Completing the cycle would be lower prices, which would lead to drastic cutbacks in rosin supplies. It is plain why the producers fear wild gyrations in supply and prices.

Outlook during the next few years, however, is for prices to stay in the $11-15/100-lbs. range. Prospects of returning to the $8-9/100-lbs. range seem slim, unless, of course, the industry completely reverses itself, turns out more than it can sell.

Gum Rosin—Supply Key: Increased output of rosin during the next few years will come mostly from gum sources. But to encourage investment in these new sources the industry must be assured of a favorable price. George Varn of Varn Trading Co. figures the individual pine-tree tapper must invest about $5,000/crop to get into production.

This heavy investment, plus present wage levels and the slow production techniques, can be justified only if rosin prices stay near $12-13/100 lbs. Prices must remain at that level also to stimulate increased production, Varn says. But if prices become overly attractive, the present supply/-demand picture could reverse itself in another two or three years. Thus industry and government officials who are trying to increase gum production also point out to the 3,300 gum farmers now tapping trees the danger of overexpansion.

Wood Rosin Still Tops: Major U.S. source of rosin today is wood stumps. During the '59-'60 crop year 1.198 million drums were extracted from stumps, and output in the current year will be up slightly, to about 1.2 million drums. Higher prices have helped to maintain output from this source. It is estimated that during the period when the rosin price was $8/-100 lbs. producers would have to obtain stumps within a 150-mile radius to make a profit. Today, under the stimulation of higher tabs, producers are able to fan out, absorb the higher transportation costs in bringing stumps from outlying areas.

How long the wood rosin producers will be able to continue to supply these large quantities of material is difficult to answer. Some say the industry will run out of stumps by the end of this decade. Others believe that, at today's quotes or even slightly lower, wood rosin will be able to continue to fulfill a large part of the rosin industry's needs during the next decade. In either case, the best that can be expected from this source is that it will be able to sustain production at or somewhat below present levels.

Tall oil output will continue to inch up during the next few years, but won't be nearly enough to meet increased demands for rosin.

At this week's meeting of American Oil Chemists' Society in New York, J. M. Wafer, vice-president of West Virginia Pulp and Paper, reported that tall oil fractionating capacity may not be fully utilized for two or three years, despite heavy demands for rosin. Reason: increased use of hardwood (which contain no fats or rosins) for sulfate pulp operations.

However, Wafer added, the industry—privately and through the Pulp Chemicals Assn.—is studying ways to increase availability of crude tall oil, to fully utilize existing capacity.

Outlook: In any case, rosin output next year will be in a tight position. If the producers can hold the present price line and at the same time bring in additional supplies without flooding the market, they will be able to enjoy a healthy market in the years ahead. Wide fluctuations in price and supplies, on the other hand, could force consumers into the market-killing practice of using substitutes.

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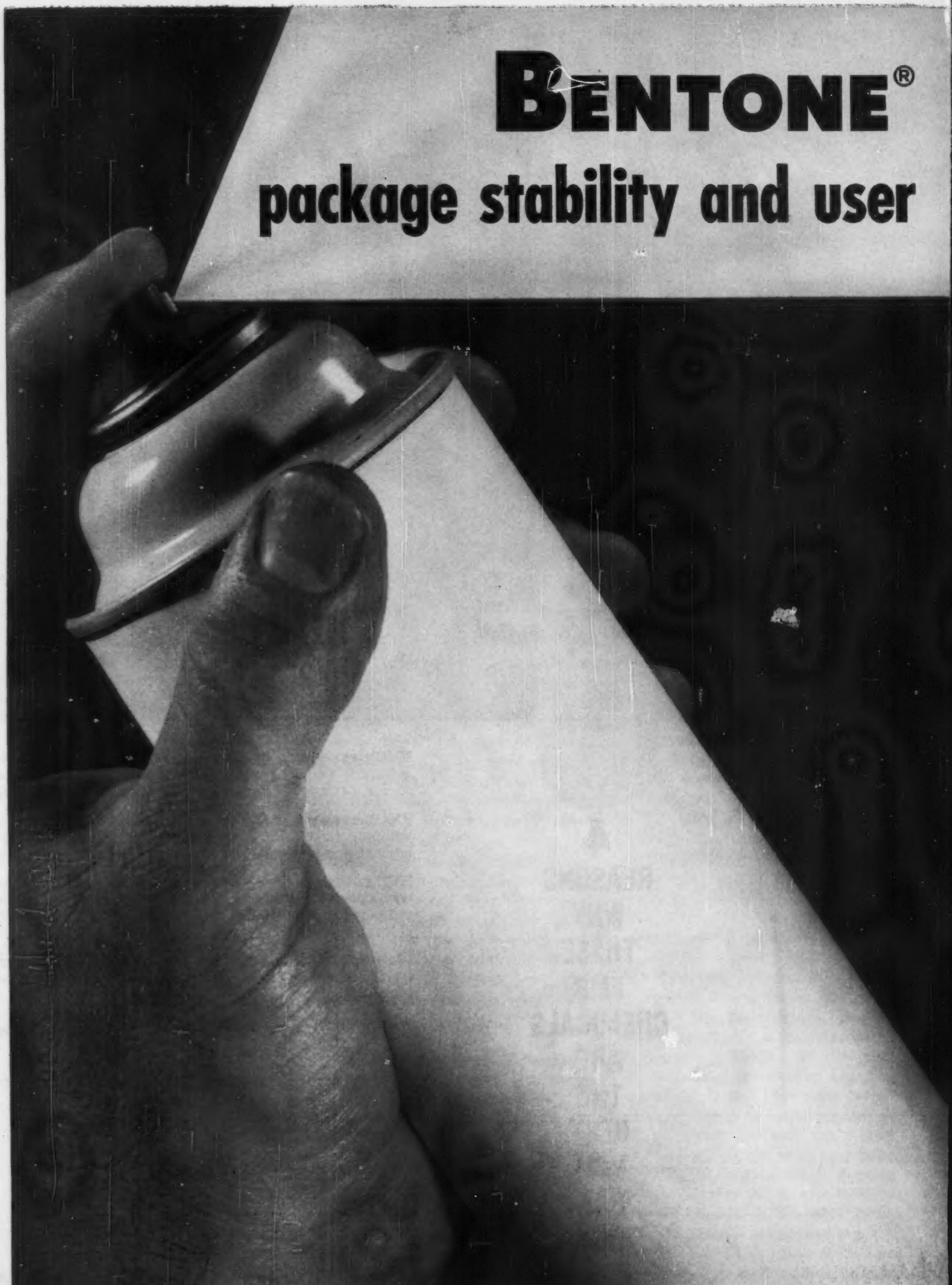
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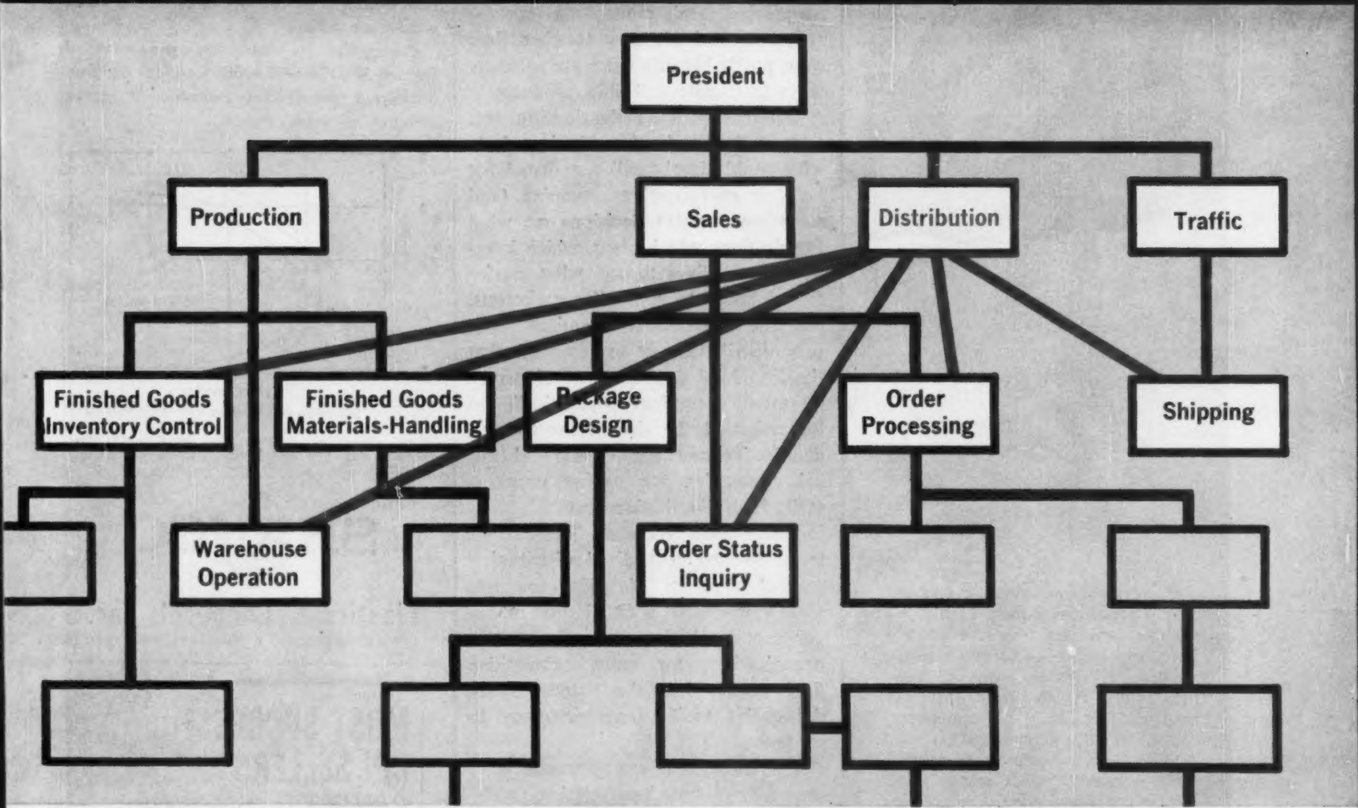
Distribution Management Reaches into Many Functions



CPI Swings Toward Integrated Distribution

How can CPI marketing management fight the current profit squeeze most effectively while improving overall marketing efficiency? A just-completed Chemical Week survey shows one way that's becoming increasingly popular: centralize responsibility for all aspects of physical distribution in a "distribution manager." Object: to tighten control over management's third-largest cost, that of moving finished goods to market.

Here are some of the signs of this mounting trend:

- Diamond Alkali revealed last week that it is working on a program of coordinated distribution management to slash rising sales costs, may name a "distribution manager" to head this effort.
- Monsanto is currently testing a distribution setup something like the one shown above, in 10 Western states. Object: to learn whether it actually cuts costs, frees salesmen for more intensive selling.
- Du Pont is now extensively studying its entire distribution network.
- The Manufacturing Chemists' Assn. recently took steps to recognize the growing importance of integrated physical distribution management by creating a Physical Distribution Subcommittee of its Traffic Committee.

Tightening Distribution: Actually, the idea of integrating all facets of distribution under one manager is not new. Some chemical producers have been operating with unified distribution activities for many years (e.g., Dow Chemical, Nalco Chemical, Shell Chemical, United Carbon, Lever Brothers). But the chemical industry in general has been slow to act, has lagged far behind the food and cosmetics industries in this approach.

Many chemical companies have clung to the view that their job of selling mainly tank-car lots of materials to well-defined markets doesn't need any complicated organization. Now, however, many marketers are beginning to feel that it's time to change, that "no other corporate function offers as much promise for improved performance and cost reduction."

They say that "tank-car thinking" has run smack into trouble. Markets have become much more competitive, forcing producers to trim their distribution costs, improve their shipping speed and reliability. And total costs of distribution have raced ahead faster than most others—distribution is now the third-largest expense on the corporate balance sheet, right after labor and raw materials. Moreover it has jumped from about 10-15% of the

sales dollar during the '40s to something like 25-30% of total sales.

Pinpointing Costs: Although the need for efficiency in distribution is now greater, the central problem—identifying and controlling costs—remains. And it's now tougher than ever, partly because there are so many ways to handle and ship products.

Whereas product distribution was once in the hands of a shipping clerk, who could simply call a railroad for help, it now involves complex (and sometimes costly) decisions on what to ship from which plant, which intermediate facilities to use, what carrier to try, when to resupply warehouses, and the like. Today chemical products distribution is so involved that the line haul cost (cost of transportation) of a product is practically no indication of the size of the over-all distribution cost. Result: many chemical companies are paying unnecessarily high distribution costs.

Distribution Manager: The current trend toward centralized distribution control supports chemical management's belief that a distribution manager can cut high costs, release sales organizations for more competitive field work. How the managers are doing this varies from company to company.

The most common approach is to group those functions relating to distribution (*above*) under one man, give him corporate authority for all such matters.

Diamond Alkali, for example, has given this job to its traffic manager, Warren Ross. So far, Ross has made some inventory and warehouse studies, saved the firm $30,000 in one metropolitan area by a warehouse switch, and eliminated two of Diamond's three Cleveland-area warehouses in another move.

Monsanto has also given its West Coast traffic manager control over its current "pilot" distribution test. In the program, set up jointly by Monsanto's traffic and purchasing groups, all sales warehousing and less-than-carload shipments for all departments in 10 Western states are being handled by a separate distribution organization, rather than by normal sales office personnel.

Monsanto says that under its regular setup (not included in the test program) both sales and traffic men are responsible for portions of the dis-

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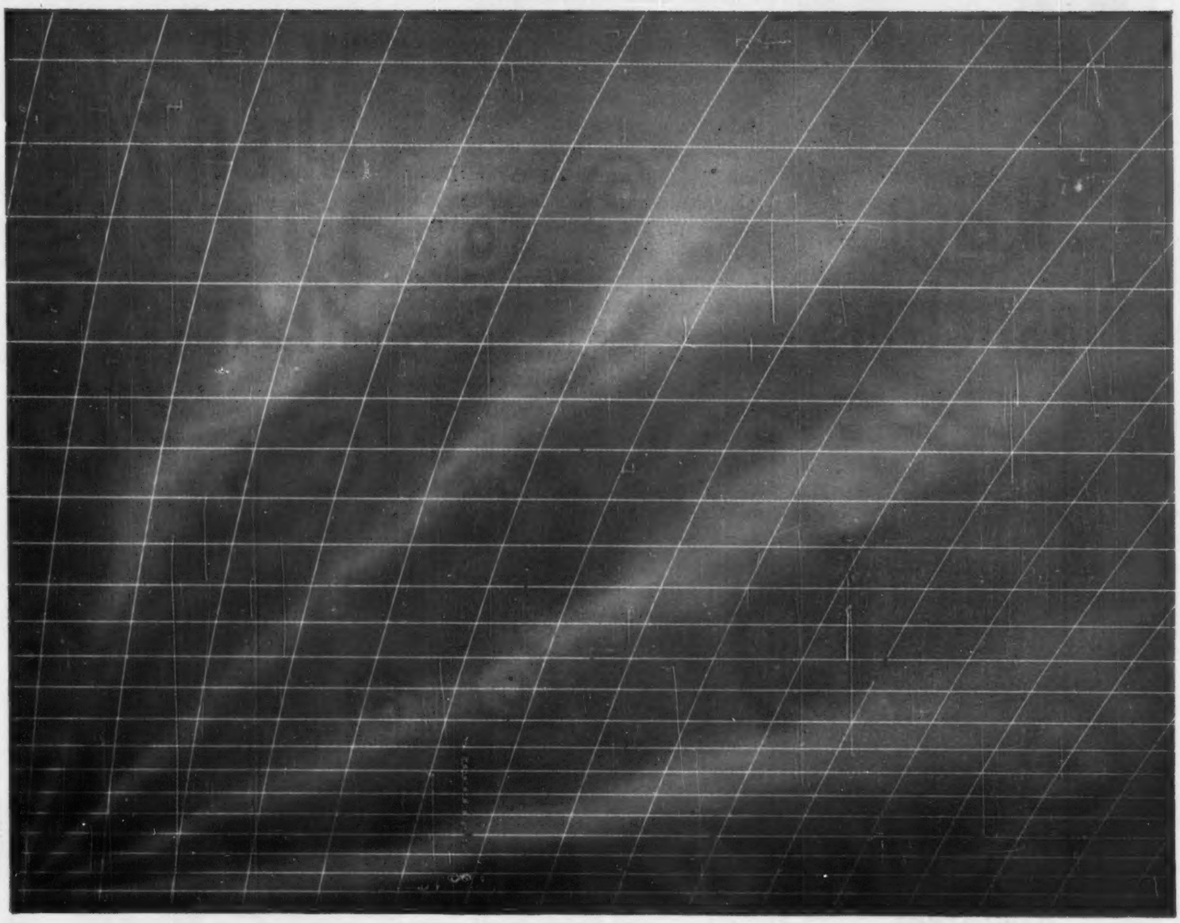

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tribution effort, causing certain "gray areas" of control to exist. The company is also considering moving certain other jobs (finished goods inventory and materials-handling) into the distribution operation.

But other firms tackle the distribution job differently. At Parke, Davis (Detroit) responsibility for all distribution matters is vested in Vice-President Graydon Walker. He heads the 1,100-man sales force, oversees market analysis, and is on the inventory committee—besides directing the company's entire distribution effort, including branch warehousing and production scheduling.

And Hercules Powder Co. (Wilmington, Del.) controls its distribution effort through a committee. Department representatives are traffic, packaging, engineering and accounting (to watch over inventories).

But regardless of how companies organize to better control their product distribution, or precisely what distribution functions they consider to be important to the over-all distribution scheme (they differ greatly), the companies that have integrated distribution report numerous advantages:

- Simpler gathering, analysis and control of total distribution costs.
- Faster, more reliable deliveries to customers, enabling them to operate on shorter inventories.
- Less burdensome paper work and follow-up required of sales office staffers.
- Better basis for quantity discounts.
- Sounder basis for adopting new shipping methods by creating a better balance between service needs and the costs of that service.

But opponents of integrated distribution management cite several disadvantages. They say such a system is more troublesome—because of "red tape controls"—than it's worth.

Others point out that it interferes with local traffic management's ability to come up with special "deals" on certain product movements. And some oppose such a method because it seems to encroach upon duties that now rest with sales, manufacturing or traffic, possibly weakening these departments by depriving them of certain of their functions.

The latter reason seems particularly important to some traffic men. Koppers Co.'s traffic head, J. F. Haley,

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puts it this way: "This whole problem is about 94% a matter of semantics."

Problems Ahead: But despite this sort of opposition, management must explore every avenue toward reduction of distribution costs.

Generally, marketing men foresee only a gradual acceptance of the switch to centralization, rather than a quick changeover. The change involves several corporate functions, and must therefore be done delicately. An even more pressing consideration is the acute shortage of top-notch distribution men to handle such a broad assignment. Naturally, traffic men have the inside track on these jobs since transportation is still the biggest aspect of distribution. But a successful distribution chief must also be trained in accounting, packaging, sales.

It is clear that it may still be a while before industry could complete a transformation to use of distribution managers. But the need for more profitable operation is a strong spur to this phase of marketing evolution.

Sales By the Pledge

Spencer Chemical Co. is pushing ahead with a fertilizer sales promotional contest — in which customers, not salesmen, will be the winners. Only entrance requirement: that the farmer-customer "consult" his fertilizer dealer about his needs. There are already a raft of contestants.

Here's how it works: Spencer has distributed thousands of "profit pledge" cards to fertilizer dealers across the U.S. and is including the cards in advertisements in leading farm publications. To enter the contest, a farmer must fill out the card, pledging to consult his fertilizer dealer for advice in planning his fertilizer needs for next year. A drawing will be held next year to choose the winner.

The winning farmer will receive all the fertilizer his land can profitably use in '61, in any form he specifies. Spencer agronomists will analyze the winner's needs, but the company has placed a ceiling of $2,500 on the top prize. Other prizes: 25 farmers will each get $100 worth of fertilizer.

Spencer doesn't know yet how much fertilizer it will sell through its "Soil Fertility Sweepstakes," but early returns have been encouraging to the company: over 2,000 farmers have signed pledge cards already.

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POSITION VACANT

Chemical Salesman—B.A. or B.S. chemistry (1-2 years organic chemistry) career opportunity in large well established expanding company for men with expereince in chemical sales. N.J., N.Y. & New England areas. Send complete resume, indicate salary requirements. Replies confidential. Lucidol Division, Wallace & Tiernan, Inc., 25 Main St., Belleville, N.J.

SELLING OPPORTUNITY AVAILABLE

Experienced Salesman—Industrial Chemicals: to handle sale of plasticizers, intermediates, and coal chemicals in major Eastern territory. Must have at least three years experience in chemical sales and degree in Chemistry or Chemical Engineering. Write, in confidence, to Sales Manager, Industrial Chemicals Division, Pittsburgh Chemical Company, 2000 Grant Building, Pittsburgh 19 Penna., giving background and qualifications.

CONTRACT WORK WANTED

Contract Fermentation—Have modern stainless steel fermenters. Handle bacterial, fungal and streptomyces fermentations, etc. Excellent laboratory facilities. CWW-5506, Chemical Week.

Belgian chemical plant located in Brussels area alongside canal to Antwerp, with equipment for processing of liquids and powders (grinding, drying, milling, blending, packing, etc. . . .) wishes to diversify present production range or start new industrial activities covering Common Market countries. All types of co-operation (license, contract manufacturing or others) will be considered. All communications received will be treated confidentially. CWW-5715, Chemical Week.

BUSINESS OPPORTUNITY

European Chemical Co. has need for Consultant: Chemical Specialties for Metal Industry. We demand process improvement new process—application know how etc. Contact: Havas Paris no 262/598 rue Vivienne 17 Paris.

BOOKS

Manual of Construction Management. For Chemical and Process Plant. National Schools of Construction. Publishers. Satsuma, Florida.

CHEMICALS FOR SALE

New Chemicals Available. Dipicolinic Acid (Pyridine 2, 6-dicarboxylic Acid) 2—Ethyl Pridine. The Midland Tar Distillers, Inc., 1143 E. Jersey St., Elizabeth, N.J. Elizabeth 3-6060.

EQUIPMENT FOR SALE

American 42" x 120" double drum dryer, ASME, Stainless conveyors & hood Reeves varidrive, 30 HP XP motor. Perry. 1415 N. Sixth St., Phila. 22, Pa.

800 sq. ft. T316 Stainless heat exchanger, 5/8" OD tubes, removable bundle, Stainless heads. Perry, 1415 N. Sixth St., Phila. 22, Pa.

1800 gal. T316 Stainless jacketed reactor, vacuum internal, agitator, 7½ HP drive. Perry, 1415 N. Sixth St., Phila. 22, Pa.

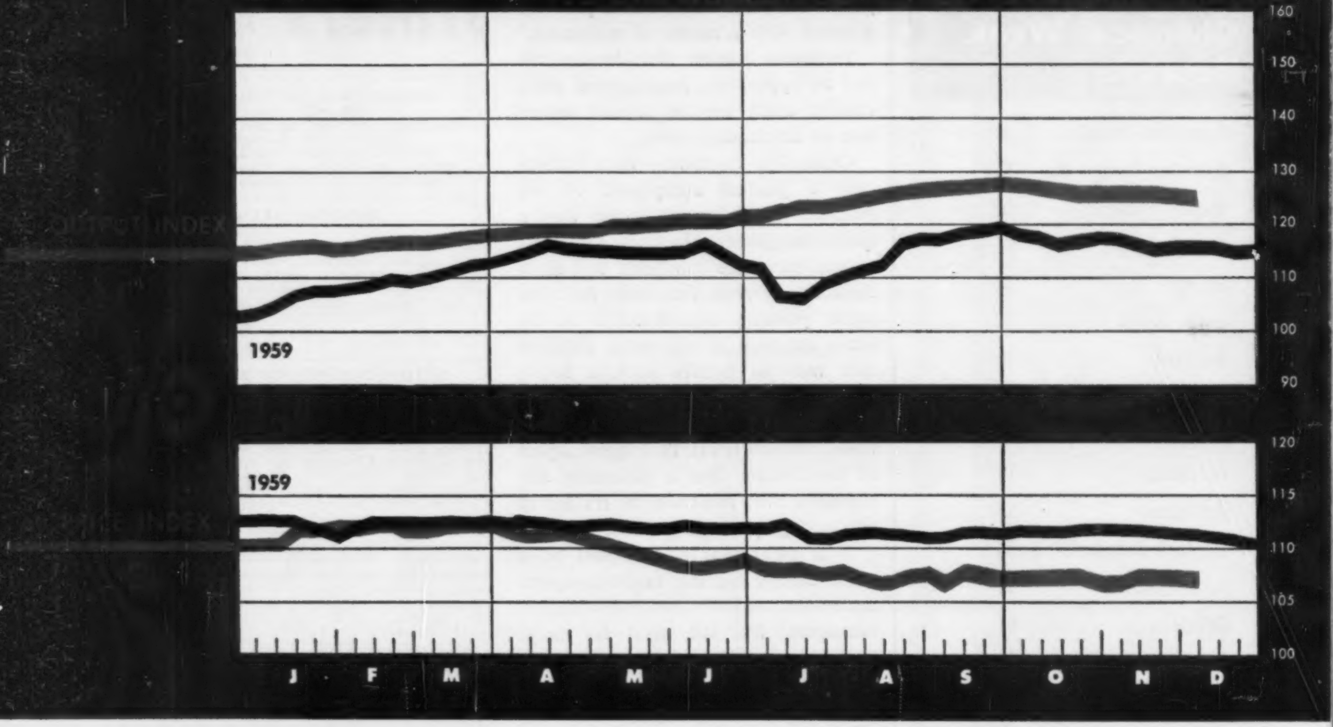
Closeout of Corning and Jena borosilicate laboratory glassware, chemicals and equipment; beakers, flasks, graduates, stopcocks, ground joints, and equipment etc. Includes balances, centrifuges, vacuum pumps, ovens, furnaces, filterpaper, microscopes, etc. Savings 30-60%. Send for Catalog. Kern Laboratory Supply Co., 2611 Exposition Blvd., Los Angeles 18, California, TWX: LA 148.

60" dia. x 35 plate T316 stainless bubble cap column, 42' high, dished heads. Perry, 1415 N. Sixth St., Phila. 22, Pa.

CHEMICALS WANTED

Surplus Wanted—Chemicals, Pharmaceuticals, Oils, Acids, Plasticizers, Resins, Dyes, Solvents, Pigments, Etc. Chemical Service Corporation, 96-02 Beaver Street, New York 5, N. Y. HAnover 2-6970.

BUSINESS BENCHMARKS



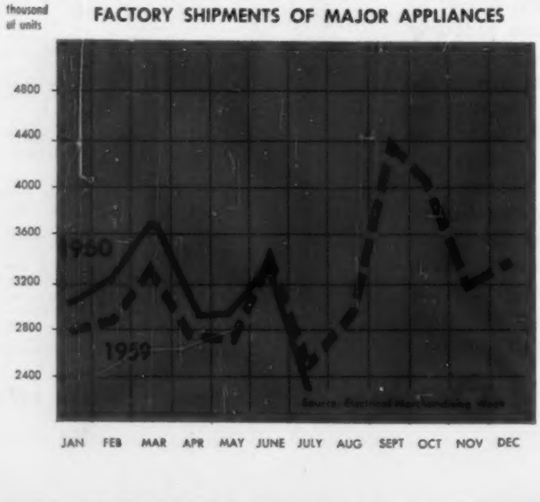
DECEMBER 10, 1960

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Chemical Week output index (1957=100)	124.8	125.0	116.9
Chemical Week wholesale price index (1947=100)	106.8	107.0	110.8
Stock price index (12 firms, Standard & Poor's)	45.76	46.71	60.61
Steel ingot output (thousand tons)	1,404	1,367	2,650
Electric power (million kilowatt-hours)	13,500	14,042	13,173
Crude oil and condensate (daily av., thousand bbls.)	6,993	6,968	6,969

FOREIGN TRADE INDICATORS (thousands of dollars)	EXPORTS			IMPORTS		
	Latest Month	Preceding Month	Year Ago	Latest Month	Preceding Month	Year Ago
Chemicals, total	141.8	140.9	139.6	28.1	28.0	28.0
Coal-tar products	15.2	12.7	9.4	4.4	5.6	6.7
Industrial chemicals	24.9	26.8	26.2	8.8	10.0	10.6
Medicinals and pharmaceuticals	21.4	24.8	26.2	1.7	2.4	1.8
Fertilizers and materials	12.0	10.7	8.0	10.2	6.5	6.0
Vegetable oils and fat (inedible)	3.5	14.0	11.8	7.2	6.1	6.7

CHEMICAL CUSTOMERS CLOSE-UP

FACTORY SHIPMENTS OF MAJOR APPLIANCES



SHIPMENTS OF EXPLOSIVES